STAKEHOLDER DRAFT
CONFIRMATORY SAMPLING
PHASE 2 WORK PLAN
FORT STEWART
HINESVILLE, GEORGIA

MAY 2010

Prepared for:

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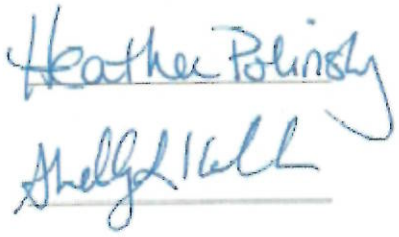
CONFIRMATORY SAMPLING PHASE 2 WORK PLAN FORT STEWART HINESVILLE, GEORGIA

DoD Contract Number: W912DR-09-D-0016

Reviewed and Approved by:



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Malcolm Pirnie, Inc. prepared this report at the direction of the United States Army Corps of Engineers (USACE). This document should be used only with the approval of the USACE. This report is based, in part, on information provided in other documents and is subject to the limitations and qualifications presented in the referenced documents.

MAY 2010

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ACRONYMS

Acronym	Definition
µg/kg	microns per kilogram
CA	Corrective Action
CAR	Corrective Action Report
CFR	Code of Federal Regulations
CMS	Corrective Measures Study
CS	Confirmatory Sampling
CTC	Cost to Complete
DQCR	Daily Quality Control Report
DQI	Data Quality Indicator
DQO	Data Quality Objective
EOD	Explosive Ordnance Disposal
ERIS	Environmental Restoration Information System
FTSW	Fort Stewart
GAEPD	Georgia Environmental Protection Division
GIS	Geographic Information System
GPS	Global Positioning System
HRR	Historical Records Review
LOD	Limit of Detection
LOQ	Limit of Quantitation
MC	Munitions Constituents
MEC	Munitions and Explosives of Concern
MMRP	Military Munitions Response Program
MRS	Munitions Response Site
MS/MSD	Matrix Spike/Matrix Spike Duplicate
N/A	Not Applicable
NFA	No Further Action
PM	Project Manager
POC	Point of Contact
PQO	Project Quality Objective
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RSL	Regional Screening Levels
SI	Site Inspection
SOP	Standard Operating Procedure
TCL	Target Compound List
TPP	Technical Project Planning
UFP	Uniform Federal Poicy
U.S.	United States
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Command
USEPA	United States Environmental Protection Agency

1 INTRODUCTION

Malcolm Pirnie, Inc. (Malcolm Pirnie) has prepared this Resource Conservation Recovery Act (RCRA) Confirmatory Sampling (CS) Work Plan for the Military Munitions Response Program (MMRP) eligible sites at Fort Stewart (FTSW), Georgia (GA), under United States (U.S.) Army Corps of Engineers (USACE) Contract Number W912DR-09-D-0016, Delivery Order 0004. This CS Work Plan is intended to meet the requirements of a MMRP Site Inspection (SI) Work Plan.

An installation-wide MMRP CS Report was completed at FTSW in November 2007. As part of the 2007 CS, an installation-wide MMRP Work Plan was also completed (finalized in March 2007). FTSW recently has expanded the cantonment area; to accomplish this, an approximately 4,240-acre portion of the operational footprint has been re-designated as other than operational and is no longer excluded from the MMRP. This Phase 2 MMRP Work Plan is a continuation of the initial 2007 MMRP Work Plan and is focused on evaluating the potential presence of historical munitions use on the 4,240-acre redesignated parcel. The additional MRSs include: the Anti-Tank Range 90MM – 2, Anti-Aircraft Range – 4, Grenade Launcher Range, and Small Arms Range - 2 (Map 1-1).

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FTSW consists of 279,081 acres and is located north of Hinesville, GA, approximately 40 miles southwest of Savannah, GA. FTSW is the largest Army installation east of the Mississippi River, spanning portions of Bryan, Evans, Liberty, Long, and Tattnall counties. FTSW is bisected by Georgia Highway 119, which runs north to south from Pembroke to Hinesville and Georgia Highway 144, which runs east to west from Richmond Hill to Glennville. Situated south of Interstate 16 and west of Interstate 95, the installation boundaries are roughly defined by the intersection of Interstate 16 and Interstate 95 and the cities of Richmond Hill, Hinesville, Glennville, Claxton, and Pembroke.

Currently, the mission of FTSW is to sustain a quality of life and reservation support at the level necessary for divisions and non-divisional, tenant, and Reserve Component units to accomplish their training missions.

This Work Plan has been developed to provide a description of the tasks necessary to complete this project and to ensure that the project will conform with the USACE, Baltimore District project Performance Work Statement (PWS), dated 5 May 2009. In addition, this Work Plan incorporates the resolutions and ideas generated during the review and development process for this project. This Work Plan includes the following project specific information:

- Project objectives
- Project management
- Schedule
- Personnel
- Site location and history
- Field work
- Laboratory analyses
- Health and safety

The Uniform Federal Policy Quality Assurance Program Plan (QAPP) (Appendix A), Health and Safety Plan (HASP) (Appendix B), and Technical Project Planning (TPP) Meeting Minutes (Appendix C) are incorporated in this Work Plan.

This Work Plan will be used with the understanding that unanticipated conditions may dictate a change in the plan as written. Any necessary deviations from the plan will be brought to the attention of the USACE, Baltimore District Project Manager (PM) as soon as possible, and a written request for variance will be submitted to document the decision made.

1.1 PROJECT OBJECTIVES

The purpose of this project is to determine the presence or absence of munitions and explosives of concern (MEC) and munitions constituents (MC) that may remain from activities conducted by the Department of Defense (DoD) during operation of these sites and that may pose a threat to human health and/or the environment. The CS Work Plan and CS Report are intended to meet the goal of a MMRP SI Work Plan and SI Report. The primary goal of a MMRP SI and this CS is to collect information necessary to make one of the following decisions: 1) whether a RCRA

Facilities Investigation (RFI)/Corrective Measures Study (CMS) is required at a MRS; 2) whether an immediate response is needed; or 3) whether the MRS qualifies for no further action (NFA). The CS Report at FTSW will investigate the explosive safety threat posed by MEC at the MMRP eligible sites (Munitions Response Sites [MRSs or MRS]). It will also investigate human and ecological heath risks and environmental impacts associated with MC contamination at the MRSs on FTSW. The secondary goal of the CS is to collect information to complete the Cost to Complete (CTC) estimates and data to apply the MRS Prioritization Protocol for the MRSs. The data collected for this CS Report will be used to meet the secondary goal of the SI.

1.2 PROJECT MANAGEMENT

Malcolm Pirnie will provide all of the documents and will participate in all of the meetings and conference calls in accordance with the protocols stated in the USACE, Baltimore District project PWS and the Project Management Plan. The project schedule and personnel involved are outlined below.

1.2.1 Project Schedule

The project schedule has been established according to the performance of the following tasks as delineated by the USACE, Baltimore District project PWS.

- Task 1 – Stakeholder involvement
- Task 2 – Historical Records Review (HRR)
- Task 3 – TPP
- Task 4 – CS

The project schedule is provided in Attachment F.

1.2.2 Project Personnel

1.2.2.1 Malcolm Pirnie Project Personnel

Malcolm Pirnie project personnel and their responsibilities are listed in **Table 1-1**.

Table 1-1: Project Personnel

Name	Title
Heather Polinsky	Malcolm Pirnie Program Manager
Charles Myers	Malcolm Pirnie Corporate Health and Safety (H&S) Director (HSD)
Shelly Kolb	Malcolm Pirnie PM
Rosemarie Fehrman	Deputy/Field PM (FPM)
Marla Miller	Malcolm Pirnie Project Chemist
George Overby	Field personnel - MEC survey/ Unexploded Ordnance (UXO) Health and Safety Supervisor (UXOSS)
To Be Determined	Field personnel - MC sampling

Malcolm Pirnie Program Manager – Heather Polinsky

The Malcolm Pirnie Program Manager oversees the Malcolm Pirnie PM and reports directly to the USACE, Baltimore District PM. Any issues or problems the USACE, Baltimore District may experience with the Malcolm Pirnie PM may be addressed to the Malcolm Pirnie Program Manager. The Malcolm Pirnie Program Manager has full authority over the performance of the project and can direct changes in project implementation.

Malcolm Pirnie Corporate HSD – Charles Myers

The Malcolm Pirnie Corporate HSD maintains the organizational freedom and authority for ensuring full implementation of the Site Safety and Health Plan (SSHP) and Malcolm Pirnie's corporate H&S policy. The HSD can direct how the SSHP is implemented. This can include delegating authority to other personnel and directing the enforcement of the SSHP, including removing individuals from the project for non-compliance.

Malcolm Pirnie PM – Shelly Kolb

The Malcolm Pirnie PM has ultimate responsibility for all aspects of the project and reports directly to the Malcolm Pirnie Program Manager, Malcolm Pirnie Corporate HSD, and the USACE, Baltimore District PM. The Malcolm Pirnie PM is also responsible for project personnel safety and health, including correction of all identified unsafe acts or conditions and enforcement of procedures and regulations.

Malcolm Pirnie Deputy/FPM – Rosemarie Fehrman

The Malcolm Pirnie FPM is the primary contact for performance of field activities. The FPM is responsible for work with field staff for the implementation of the Work Plan, including the project quality assurance/quality control (QA/QC) requirements. The FPM will be on-site during field activities.

Malcolm Pirnie UXOSS– George Overby

The Malcolm Pirnie UXOSS reports to the Malcolm Pirnie PM for all aspects of the fieldwork and is responsible for enforcing all aspects of safety and health rules, policies, and procedures on behalf of Malcolm Pirnie.

Malcolm Pirnie Project Chemist – Marla Miller

The Project Chemist is responsible for the day to day management of the data at all stages to ensure that all project activities related to analytical data are performed to meet the project data quality objectives (DQOs).

1.2.2.2 Other Project Personnel

Table 1-3 lists the individuals and associated agencies/organizations also involved with this project. They are also included in the document distribution list.

Table 1-2: Other Project Personnel

Name	Org Code	Title	Work Phone
Army Environmental Command (AEC)			
Alan Freed	SFIM-AEC	Restoration Manager	410-436-0498
USACE, Baltimore District			
Marc Randrianarivelo	CENAB-EN-HM	PM	410-962-4869
USACE, Savannah District			
Zsolt Haverland	CESAS-EN-HM	Technical Manager	912-652-5815
FTSW			
Algeana Stevenson	FTSW/Hunter Army Airfield	PM	912-315-5144
Georgia Environmental Protection Division (GAEPD)			
A. Mohamad Ghazi	Hazardous Waste Center Management Branch	Environmental Engineer	404-463-7513

1.2.2.3 Subcontractors

Subcontractors report to the Malcolm Pirnie FPM and UXOSS during performance of the tasks associated with their fieldwork and are responsible for complying with the project Work Plan while on-site. Katahdin Analytical Services, Department of Defense Environmental Laboratory Approval Program certifications, has been hired by Malcolm Pirnie to help complete this project. Laboratory qualifications are provided in the QAPP.

1.3 WORK PLAN ORGANIZATION

The Work Plan is organized as follows:

- **Section 1: Introduction**, the Work Plan consists of seven sections and five appendices. The remaining six sections and appendices of the Work Plan are outlined below:
- **Section 2: Project Overview** discusses the proposed activities to be conducted by Malcolm Pirnie as part of the CS.
- **Section 3: Technical Approach** outlines methods and overall QA/QC procedures.
- **Section 4: Field Activities** presents a detailed description of each MRS and site-specific field activities for the CS.
- **Section 5: Sample Management and Analysis** outlines field guidelines, including QA/QC associated with sample management. This section includes sample packaging and shipping requirements and investigative derived wastes (IDW) procedures.
- **Section 6: References**
- **Appendix A: QAPP**
- **Appendix B: HASP**
- **Appendix C: TPP Meeting Minutes**
- **Appendix D: Field Forms**
- **Appendix E: HRR Conceptual Site Model**
- **Appendix F: Project Schedule**
- **Appendix G: Ordnance Technical Data Sheets**

2 PROJECT OVERVIEW

The MMRP SI process, being conducted under RCRA correction action process for Fort Stewart, consists of five primary tasks which include the HRR, TPP, CS Work Plan, CS fieldwork, and CS Report.

HRR – consists of identifying data gaps from the U.S. Army's Phase 3 Closed, Transferring, and Transferred (CTT) Inventory and obtaining and reviewing historical records. The HRR is aimed at developing a draft Conceptual Site Model (CSM), focusing field work, and providing a common understanding of the MRS.

TPP – consists of planning activities conducted with the stakeholders to identify project objectives and designing data collection programs to meet objectives.

CS Work Plan – consists of preparing and submitting a site-specific Work Plan document reflecting the agreements made during the TPP session.

CS fieldwork – consists of performing investigation activities and preparing reports of findings as described in this Work Plan.

CS Report – consists of preparing and submitting a CS Report summarizing the results of the fieldwork, to include an updated CSM developed for each MRS with an appendix containing all information necessary to complete the MRS Prioritization Protocol.

2.1 HRR

A HRR for FTSW is scheduled to be finalized in May 2010 in support of CS. This document expanded on the information collected during the Phase 3 CTT Range Inventory and provided information pertinent to identifying, verifying, and establishing the physical limits and potential MEC and MC for each MRS. Historical records, aerial photos, existing site maps, and existing environmental restoration documents were reviewed, and interviews with installation personnel

were completed. An existing installation-specific background study, including sample analysis for metals, was reviewed. The following information is provided in the HRR:

- Project purpose/scope
- Project drivers
- Installation description/history
- Phase 3 CTT Range Inventory results
- Data collection and document review process
- MRS descriptions/HRR findings
- Draft CSM
  - MMRP site profile
    - Area and layout
    - Structures
    - Utilities
    - Boundaries
    - Security
  - Physical profile
    - Climate
    - Geology
    - Topography
    - Soil
    - Hydrogeology
    - Hydrology
    - Vegetation
  - Land use and exposure profile
    - Human receptors (current and future)
    - Zoning/land use restrictions
    - Beneficial resources
    - Demographics
  - Ecological profile
    - Habitat type
    - Degree of disturbance
    - Ecological receptors
  - Munitions/release profile
    - Munitions types and release mechanisms
    - Maximum probable penetration depth
    - MEC density
    - Munitions debris
    - Associated MC
    - Transport mechanisms/migration routes
  - Pathway analyses for MEC and MC
- Conclusions

This report documents the field activities planned for the additional MRSs not addressed during the March 2007 MMRP SI Work Plan. The focus of this Phase 2 MMRP HRR is to evaluate approximately 4,240 acres of property that have been redesignated as other than operational. In January 2009, a Preliminary Assessment (PA) of Small Arms Range – 2 was conducted. The purpose of the PA was to determine the MMRP eligibility of Small Arms Range – 2. As a result of this effort, it was determined that Small Arms Range – 2 was MMRP eligible and that further evaluation in the form of a CS investigation was warranted. During research completed as part of this HRR for the Small Arms Range – 2, three additional MRSs were identified in the newly reclassified area: the Anti-Tank Range 90MM – 2, Anti-Aircraft Range – 4, and Grenade Launcher Range.

As a result of the findings of the Phase 2 HRR, there are a total of four MMRP eligible sites (1,626 acres) at FTSW. Comments from the USACE, Baltimore District; USAEC, FTSW, and the stakeholders were incorporated into the Final HRR Report. The MRSs identified in the HRR are presented on Map 2-1. Summaries of each MRS are provided in Section 4 of this Report.

2.2 TPP Process/Stakeholder Data Quality Objective Process

The TPP process is a comprehensive and systematic process that involves four phases of planning activities. It was developed for identifying project objectives and designing data collection programs. Use of the TPP process is consistent with the philosophy of taking a graded approach to planning that will produce the type and quality of results needed for site-specific decision-making.

A TPP session was held at FTSW on April 29, 2010. The results of the TPP session dictated the MEC and MC sampling/field activities planned for the installation. Table 2-1 provides a summary of decisions made to address MEC, and Table 2-2 provides a summary of decisions made to address MC. The Draft Meeting Minutes from the April 29, 2010 TPP session are included for review in Appendix C.

Table 2-1: Summary of MEC TPP Decisions

MRS	MEC CS Activities	
	Activity	Purpose
Anti – Aircraft Range -4	Magnetometer assisted visual survey during sampling activities of 100% of the undeveloped acres (20 acres).	Recommend RFI/CMS for MRS based on historical evidence of multiple overlapping range fans and multiple explosive ordnance disposal (EOD) responses.
Anti – Tank Range 90MM - 2	Magnetometer assisted visual survey during sampling activities of 10% of the undeveloped acres (33 acres).	Recommend RFI/CMS for MRS based on historical evidence of multiple overlapping range fans.
Grenade Launcher Range	Magnetometer assisted visual survey during sampling activities of 10% of the undeveloped acres (4 acres).	Recommend RFI/CMS for MRS based on historical evidence of multiple overlapping range fans.
Small Arms Range - 2	No MEC field activities are required because only small arms were used at the MRS.	

Table 2-2: Summary of MC TPP Decisions

MRS	MC CS Activities	
	Activity	Purpose
Anti – Aircraft Range - 4	Collect 4 discrete surface soil samples. Sample locations will be randomly distributed unless biased locations are identified. Analyze for explosives and metals using United States Environmental Protection Agency (USEPA) Methods 8330B modified and 6010B	To support MC RFI/CMS recommendation based on historical and multiple EOD responses. To provide data to complete the MRSPP. To gain a greater understanding of site conditions related to MC to support the next study phase and to complete the CTC. Compare data to: • FTSW Inorganic/Metal Background Study • USEPA Region 9 Regional Screening Levels (RSL) for Residential Soil • Region 4 Ecological Screening Values for surface soil
Anti – Tank Range 90MM - 2	Collect 4 discrete surface soil samples. A minimum of two samples will be biased and collected from the firing points of the Anti-Tank 90MM and Anti-Aircraft 40MM ranges. The remaining two contingency samples will be randomly distributed unless biased locations are identified. Analyze for explosives and metals using USEPA Methods 8330B modified and 6010B	Support CTC/Prioritization Protocol. RFI/CMS recommended for MRS based on historical evidence of multiple overlapping range fans Compare data to: • FTSW Inorganic/Metal Background Study • USEPA Region 9 RSL for Residential Soil • Region 4 Ecological Screening Values for surface soil
Grenade Launcher Range	Collect 14 discrete surface soil samples. Three samples each will be collected from the location of the berms of Ranges H, B, and A. Additionally, three samples will be collected from the firing point of the 120-MM Anti-aircraft Range. The remaining two contingency samples will be randomly distributed unless biased locations are identified. Analyze sample for explosives and metals using USEPA Methods 8330B modified and 6010B.	RFI/CMS recommended for MRS based on historical evidence of multiple overlapping range fans. Support MC NFA or RFI/CMS determination. Compare data to: • FTSW Inorganic/Metal Background Study • USEPA Region 9 RSL for Residential Soil • Region 4 Ecological Screening Values for surface soil

MRS	MC CS Activities	
	Activity	Purpose
Small Arms Range - 2	Collect 10 discrete surface soil samples. Eight of the ten samples will be collected from Range N. Two samples will be collected from each of the four firing positions/berms on Range N. The remaining two samples will be randomly distributed unless biased locations are identified. Lead by USEPA Method 6010B	RFI/CMS recommended for MRS based on historical evidence of multiple overlapping range fans. Support MC NFA or RFI/CMS determination. Compare data to: • FTSW Inorganic/Metal Background Study • USEPA Region 9 RSL for Residential Soil • Region 4 Ecological Screening Values for surface soil

2.3 CS Field Activities

The goal of this project is to determine the presence or absence of MEC and MC that may remain from activities conducted by the DoD during operation of these sites and that may pose a threat to human health and/or the environment.

During the field sampling event, qualified team members (UXO Technicians III) will inspect the surface for MEC and provide anomaly avoidance support. Samples will be collected to analyze for metals and explosives as dictated by historical site activities. The fieldwork will take place during July 2010 and will last approximately five days.

It is anticipated that 32 surface soil samples, plus 9 additional QC samples, will be collected for analytical laboratory analysis. The analytical methods were selected on the basis of the types of munitions known to have been used at the MRS and include the standard suite of range-related analytical parameters to account for unknown items. The standard analytical methods include metals (aluminum, antimony, copper, lead and zinc) by USEPA Method 6010B and explosives by USEPA Method 8330B modified. All field and laboratory work will be of the quality to support screening against the following in the listed order:

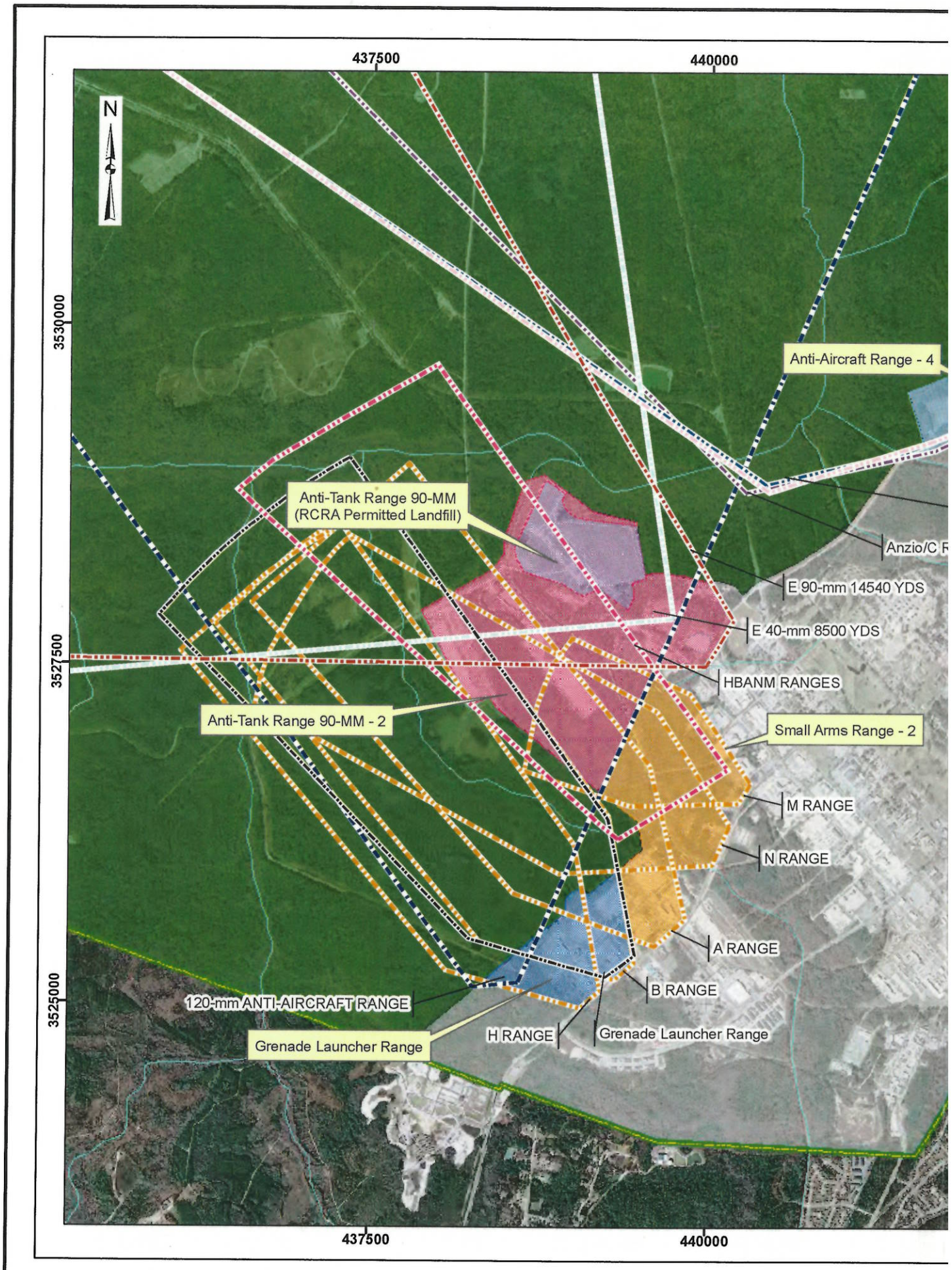
- FTSW Inorganic/Metal Background Study (April 2000)
- USEPA Region 9 RSL for Residential Soil
- Region 4 Ecological Screening Values for Surface Soil

2.4 PROJECT DELIVERABLES

In addition to this Work Plan, Malcolm Pirnie will develop and submit a CS Report, which will include the:

- Final CSM;
- Analytical data; and
- Results of instrument assisted site walk.

In accordance with the PWS, all the analytical data generated during this field effort will be uploaded into the U.S. Army's Environmental Restoration Information Systems (ERIS) web-based database. The data will include the following information for each sample collected: sample identification number; preservation; date sampled; media type; site location; chemical analyses; and validation review. The format requirements for the ERIS database are in the QAPP (Appendix A). If the ERIS database format is revised during MMRP investigations, the newly established database format shall be included as an appendix to the QAPP.


437500
440000
N
3530000
3527500
3525000
Anti-Aircraft Range - 4
Anti-Tank Range 90-MM
(RCRA Permitted Landfill)
Anzio/C R
E 90-mm 14540 YDS
E 40-mm 8500 YDS
HBANM RANGES
Anti-Tank Range 90-MM - 2
Small Arms Range - 2
M RANGE
N RANGE
A RANGE
B RANGE
120-mm ANTI-AIRCRAFT RANGE
Grenade Launcher Range
H RANGE
Grenade Launcher Range
437500
440000

3 TECHNICAL APPROACH

The sampling rationale/design for the CS is to collect sufficient data to confirm the presence/absence of MEC or MC within the areas of concern. Based upon the objectives of this CS, the following items have been incorporated into the sampling program rationale/design.

3.1 MEC ACTIVITIES

This portion of the fieldwork should be such that exclusion zone impacts, engineering control requirements, clearing and grubbing efforts, and MEC disposal activities are not required. In some cases, encountering just one MEC item will be sufficient to determine that further investigation is necessary for a particular MRS. The field activities for the CS are not intended to confirm all types of MEC present, determine MEC density, or define the exact limits of the MEC impacts. The areas over which MEC activities will be conducted are discussed in detail in Section 4.

MEC that are discovered during sampling activities will not be removed, disturbed, or otherwise compromised. The sampling team will make a photographic record of the MEC item and make field notes indicating the location of the item, its conditions, and any other pertinent information. The location of the MEC item will be recorded with Global Positioning System (GPS) equipment. This information will be recorded on the MEC/Multiple Anomaly Form which is provided in Appendix D. The field crew will notify the DPW, USAEC, and USACE, Baltimore District of any MEC items encountered at the completion of field activities each day. If multiple MEC items are encountered during the field activities DPW and USACE, Baltimore District will be contacted to decide how to proceed.

3.1.1 Instrument Assisted Visual Survey

A limited instrument assisted visual survey of the suspected MEC sites (listed in Section 4) will be performed to locate and document MEC found during the site walk. Field team personnel will conduct the visual survey while being escorted by an UXO Technician III. This activity will

be limited to a surface walkover to identify materials and/or surface features that provide information on the areas and activities in question.

A Schonstedt handheld magnetometer will be used to conduct the limited survey and detect surface MEC (primarily used for MEC anomaly avoidance for safety purposes). A transect sweep approach will be used to search the identified MRS, depending on the terrain and layout. Each transect will be approximately 5 feet in width and spaced 40 feet apart, depending on the terrain, vegetation, line-of-site, and percentage of site to be covered. Site-specific details are provided in Section 4 for each MRS.

The following steps will be conducted during the site walk:

- Prior to entering an area requiring anomaly avoidance, the UXO Technician III will conduct a tailgate safety brief. This brief will cover emergency procedures, operations, types of suspected MEC that may be encountered during the site visit, and anomaly avoidance procedures.
- The UXO Technician III will enter the site first and will conduct a surface sweep of the path as the survey team follows behind in a single file. The team will identify target areas containing MEC, to include discarded military munitions, munitions debris and masses of buried materials.
- Target areas containing MEC will be marked and documented.
- Survey of firing points (where appropriate) will be documented, the GPS locations will be recorded, and the areas will be photographed.
- The survey team will observe the area for pits, craters, and unusual holes—these could indicate impact areas, demolition sites or burial pits. These areas will be documented using the MEC/Multiple Anomaly Discovery Form, the GPS locations will be recorded, and the areas will be photographed.
- If MEC are discovered, the UXO Technician III will mark the item, GPS coordinates for the item will be recorded, and the MEC item will be logged as to its description, size, color, and any other distinguishable marks. Pertinent data will be entered on an MEC/Multiple Anomaly Discovery Form. A digital photograph of the item will be taken, and the photo number and item description will be noted in the logbook. At no time will the MEC item be moved or disturbed. After collecting the necessary data, the team will proceed with its survey.
- If any live or suspected live MEC are encountered during the limited visual survey, they will be marked for positive identification, and an immediate response trigger evaluation described in Section 3.1.2 will be performed. The FTSW DPW, USAEC, and USACE, Baltimore District will be notified if any MEC item is encountered during fieldwork

The following function check procedures will be used to perform function tests on the equipment used during the visual survey:

- Hand-held metal detectors (i.e., Schonstedt,) will be swept across known selected items within an area outside of the site to demonstrate consistent effectiveness.
- Instruments and equipment used to gather and generate data will be tested with sufficient frequency and in such a manner as to ensure that accuracy and reproducibility of results are consistent with the manufactures' specifications. Instruments or equipment failing to meet the standards will be repaired, recalibrated, or replaced. Replaced instruments or equipment must meet the same specifications for accuracy and precision as the item removed from service.

In addition an all metals detector assisted visual survey will be conducted in order to locate remnants of small arms rounds that may remain. A transect sweep approach will be used to search the identified MRS. Each transect will be approximately 5 feet in width and spaced 40 feet apart, depending on terrain, vegetation, and line-of-site.

3.1.2 Triggers for Immediate Response

MEC removals will not be conducted as part of the CS. However, the field team may encounter MEC and munitions debris during site reconnaissance. An UXO Technician III will accompany the data collection team and provide MEC escort services for all data collection personnel. Any MEC and munitions debris that is encountered will be identified to help characterize the MEC and/or MC at the MRS. Under no circumstances will MEC be handled, moved, or disturbed during the visual survey. Any MEC items encountered during the CS field activities will be reported to FTSW EOD. FTSW EOD will be responsible for disposal of MEC items encountered and reported.

The CS fieldwork is not intended to include removal or disposal actions; however, if identified, an MEC or explosives hazard must be reported, and a decision must be made about its disposition, if any. The decision is based on the overall threat to human health and the environment. The level of threat is based on an overall understanding of the situation and its risk, based on site-specific data and the factors discussed in **Table 3-1**.

Table 3-1: MEC Factors for Immediate Response Actions

MEC Factor	Status Questions
Accessibility of the MEC	Is it in an area that is restricted to the public with engineering controls that preclude entry, such as fences, security guards, or posted hazards signs? Is the MEC in an area that is accessible to the public, and does this create an imminent hazard to people or the environment?
Type of MEC	What is the condition, fuzing type, net explosive weight and specific hazards of the item? Does the MEC pose an immediate threat?
Site assessment	Do the MEC and/or MC site conditions require using protective measures such as tamping, shielding, or focusing of the heat, blast, and shockwave to mitigate the explosive effects? What is the maximum fragmentation range and over-pressure distance of the MEC?
Other considerations	Can the hazard be moved? Can the area within the fragmentation and blast distance withstand a detonation, and are there critical habitats or facilities located nearby?

For the purposes of the CS, Malcolm Pirnie will immediately report the presence of MEC and the information needed to answer the questions in **Table 3-1** for determination of the appropriate action to the USACE, Baltimore PM, USAEC, and the installation point of contact (POC).

3.2 MC Activities

The goal of the field sampling activities for MC is to determine if the MRS has been impacted by MC. Anomaly avoidance techniques will be utilized during the MC field sampling activities. Analytical results exceeding background levels and appropriate regulatory limits agreed on during the TPP session will be used for justification in moving the MRS into the RFI/CMS phase. The CS field sampling activities are not intended to determine the nature and extent of all contaminants.

All fieldwork will be of the quality needed to meet the DQOs for the project as dictated in the QAPP, the TPP Meeting Minutes, and decisions agreed upon after the TPP meeting. A decision to limit the metals analysis to primary or indicator compounds associated with the munitions history of each MRS was agreed upon after the TPP meeting. As a result of this, the metals

analysis for the FTSW MRSs will be limited to aluminum, antimony, copper, lead and zinc, which are the primary MC associated with the munitions history of these MRSs. The primary MC for the munitions items was determined utilizing the U.S. Army Technical Manuals 43-0001-28, 43-0001-29, 43-0001-30, and the MIDAS database created by the Defense Ammunition Center Technology Directorate. For MRSs where historical evidence indicates small arms use only metals analysis will be limited to lead as agreed upon during the TPP meeting. The details of the planned MEC and MC field sampling activities are provided in Section 2.

3.2.1 Surface Soil

Surface soil samples will be collected as discrete samples. Sampling rationale for each MRS is described in Section 4.

Surface soil samples will be collected with a disposable scoop or similar equipment while wearing Nitrile gloves. New scoops and gloves will be used at each sampling location. The analytical samples will be collected and placed directly into the appropriate sample containers, labeled, and placed in an ice chest chilled to a maximum temperature of 4 degrees Celsius. A portion of the sample will be set aside and used to log a description of the soil characteristics using the Unified Soil Classification System on a sample log form. After a sample is put into the ice chest, the chain of custody (COC) and Daily Quality Control Report (DQCR) forms will be filled out. The remaining soil will be disposed of on the ground surface at the locations from which they were collected. If field conditions dictate that disposable equipment cannot be used, reusable sampling equipment will be decontaminated before moving to the next sampling location. Decontamination procedures are presented in Section 3.8 of this document. If the use of reusable equipment becomes necessary, rinse blank samples will be collected as discussed in Section 3.7 of this document and as described in the QAPP. Surface sample locations will be recorded using a handheld GPS unit.

3.2.2 Chemistry Analyses

Malcolm Pirnie will meet the project-specific DQOs for sampling and analysis and the QA/QC objectives by collecting the proper quantities and types of samples, using the correct analytical methodologies, implementing field and laboratory QA/QC procedures, and using various data

validation and evaluation processes. The DQOs for each analytical method are provided in the QAPP (Appendix A). Laboratory requirements for the analytical methods being used for this project are provided below and in the QAPP. These procedures include requirements for sample preparation, sampling containers, preservation methods, and holding times.

The QAPP has been developed to support the sampling, analysis, and evaluation activities associated with this project. The QAPP consists of policies, procedures, specifications, standards, and documentation sufficient to produce data of quality adequate to meet the DQOs for the project, RCRA standards, and to minimize loss of data due to out-of-control conditions or malfunctions.

The QAPP has been prepared to ensure that this responsibility is met throughout the duration of this project. It addresses procedures to assure the precision, accuracy, representativeness, completeness, and comparability of field and laboratory data generated during the course of this project. It also provides a framework for evaluating existing data that may be used in this project. The QAPP defines the first stage of the QA requirements for sample and data acquisition, handling, and assessment.

QA procedures, such as tracking, reviewing and auditing, are implemented as necessary to ensure that all project work is performed in accordance with professional standards, USEPA and USACE regulations and guidelines, and the specific goals and requirements stated in this Work Plan.

QC of sample collection, analysis, and assessment will be performed by technical project personnel. Laboratory equipment will be maintained and calibrated, and records of these activities will be kept in accordance with established procedures. This will include laboratory oversight by Malcolm Pirnie project personnel, as well as laboratory data and document review.

Per the USEPA criteria for data quality for risk-based projects, 10% of the analytical data are required to meet a comprehensive data level of QA/QC related to sample collection, laboratory analysis, and data validation techniques. Following the processes identified in the QAPP, final

data usability will be determined by the USACE Project Chemist in coordination with the Malcolm Pirnie PM and Malcolm Pirnie Project Chemist.

Overall QA review of documentation, field sampling and laboratory QC will allow determination of the acceptability of these data for use in this project.

Sample chemical analyses are discussed in greater detail in the QAPP (Appendix A).

3.3 GPS Surveying

Each sample location will be surveyed to document the location. The GPS unit proposed for use is a Trimble GeoExplorer CE, Geo XT handheld unit. Pathfinder Office software will be used to download and post process the data to achieve sub-meter horizontal accuracy. Field conditions, such as the number of satellites available at the reading time and density of the tree canopy, dictate the amount of time needed to acquire a reading. Coordinates will be established for each sample location to an accuracy of 1 meter.

3.4 Field Equipment

A variety of equipment will be used to perform the field activities for this project. Table 3-2 lists the field equipment that will be used.

Table 3-2: Field Equipment

Category	Equipment
Surface sampling	Disposable scoops (or similar), plastic sheeting, all metals detector, Schonstedt
H&S equipment	Safety boots, safety glasses, first aid kit, fire extinguisher, protective clothing, Nitrile gloves, hard hat if a danger of falling overhead objects exists.
Shipping	Packaging tape, labels, seals, COC forms, ice, zip top bags, coolers, bubble wrap, packaging material
Documentation	DQCR forms, field log book, boring logs, all applicable H&S forms
Sample containers	See Table 4-1 in the QAPP
Decontamination supplies[1]	Liquinox or Alconox detergent, potable water, deionized (DI) water, scrub brushes, decontamination tubs/buckets
GPS	Trimble GeoExplorer CE, Geo XT handheld unit

[1] If disposable equipment cannot be used, reusable sampling equipment (with decontamination supplies) will be used

3.5 Laboratory Analysis

The analytical methods are selected on the basis of the munitions items known to have been used at the MRS and include the standard suite of range-related analytical parameters to account for unknown items. As per a decision made and agreed upon after the TPP meeting the metals analysis will be limited to primary or indicator compounds associated with the munitions history of each MRS. As a result of this the metals analysis for the FTSW MRSs will be limited to aluminum, antimony, copper, lead and zinc which are the primary MC associated with the munitions history of this MRS. For MRSs where historical evidence indicates small arms use only metals analysis will be limited to lead as agreed upon during the TPP meeting. The standard analytical methods include USEPA Methods 6010B for metals (aluminum, antimony, copper, lead, and zinc) and USEPA Method 8330B modified for explosives. Screening criteria are listed in the QAPP.

3.6 QA/QC Samples

QA and QC procedures are documented in the QAPP. QA and QC samples are samples analyzed for the purpose of assessing the quality of the sampling effort and of the analytical data.

QC samples include equipment/rinsate blanks, temperature blanks, and matrix spike/matrix spike duplicates (MS/MSD). QA samples include field duplicate samples.

3.6.1 QC Samples

Sample QC for analytical samples will be provided in the field through the use of equipment/rinsate blanks, temperature blanks, and MS/MSD. The QC samples will be handled as regular samples. In order for distinctions to be determined between study areas, the different types of samples will be submitted in separate batches for laboratory analysis. Calibrations and associated QC samples will not be mixed between sample types. Sample QC for the analytical samples will be provided in the field through the use of duplicate field samples. QC samples are used to evaluate the contract laboratory's performance. Duplicate samples are collected as a single sample, which is divided into two equal parts.

The following QC samples will be collected for analytical samples:

Matrix spikes Samples will be collected to be split in the lab and run as MS/MSD in an amount equal to at least 5% of the study area samples for laboratory analysis.

Equipment/rinsate blanks Equipment/rinsate blanks will not be collected because disposable sampling equipment will be used at the MRS. However, if field conditions dictate that equipment requiring decontamination be utilized sampling equipment will be decontaminated prior to and after each use, and equipment/rinsate blanks will be collected and analyzed in accordance with the QAPP (Appendix A), (i.e., one field blank per decontamination event per equipment type).

The number of QC samples to be collected is presented in **Table 3-3**.

3.6.2 Field Duplicate Samples

Sample QA for the analytical samples will be provided in the field through the use of field duplicate samples. QA samples are used to evaluate the contractor's laboratory performance. Duplicate samples are collected as a single sample, which is divided into two equal parts. As shown in Table-3-3, QA samples will be collected at a rate of at least 10% of the field samples collected. QA split samples will not be collected during the CS phase as discussed during

negotiations between Malcolm Pirnie and USACE prior to contract award and per Malcolm Pirnie's general assumptions submitted with the cost estimate and accepted by USACE.

Table 3-3: Quantities of Analysis

Analysis	Media	Baseline Samples[1]				
		Field Samples	Matrix Spikes[2]	Matrix Spikes Duplicate[2]	Duplicate Field Samples[3]	Total Analyses
Metals[4,5] (aluminum, antimony, copper, lead and zinc)	Soil	32	2	2	3	39
Explosives	Soil	22	1	1	2	26

(1) If equipment decontamination is necessary, then equipment blank samples must also be collected at a rate of one field blank per decontamination event per equipment type, not to exceed one per day.
(2) Two samples indicate one MS/MSD pair, collected at a rate of one pair per 20 samples.
(3) Field duplicates will be collected at a rate of one per 10 samples.
(4) As per a decision made and agreed upon after the TPP meeting the metals analysis will be limited to primary or indicator compounds associated with the munitions history of each MRS.
(5) Ten of the metals samples will be limited to lead only.

3.7 Sampling Equipment Decontamination

In an effort to achieve the highest level of QC, one time use and disposable sampling equipment will be used whenever feasible. This type of equipment includes sampling gloves, scoops, and pre-cleaned sample jars. Applicable equipment will be decontaminated as discussed in the remainder of the section.

3.7.1 Decontamination Procedures/Sample Contaminant Sources

This section provides instructions on deciding on the appropriate decontamination scheme(s) for the project field sampling equipment in order to prevent or reduce cross-contamination of project samples. The applicability of each step in a decontamination protocol will depend upon factors such as the contaminants present on-site, the subsequent analysis to be performed, and the composition of the sampling devices. The appropriateness of a decontamination protocol is vital to the eventual validity of the analytical results and decisions made based upon those results. All sampling equipment that has come in contact with a potentially contaminated media must be cleaned prior to the subsequent use of that device. Unless field conditions dictate a change in the equipment planned for use, pre-wrapped, sterile, plastic, disposable scoops will be utilized for

collecting soils samples at the installation. The scoops will be used to collect one sample and then disposed of to avoid cross-contamination between samples and locations. If field conditions dictate that other sample collection methods are required and equipment decontamination becomes necessary, all equipment will be properly decontaminated prior to and following the collection of each sample. Decontamination procedures are summarized below can be found in Section 4.7 of the QAPP (Appendix A).

3.7.2 Reagents

The detergent wash is a non-phosphate detergent solution used with brushing or circulating techniques to remove gross contamination and/or used as a mild neutralizing agent. Tap water is considered a rinse-water, preferably from a water system of known chemical composition. Acid rinses are used as the inorganic solubilizing agent or as a mild neutralizing agent. These rinses are 10:1 solution of water and acid (hydrochloric acid), respectively. The solutions are prepared from reagent grade acids and DI water. Solvent rinses are used as an organic solubilizing agent. Requirements for solvent types vary depending upon the nature of known organic contamination requiring solubilization and any impurities present within the rinse that may potentially interfere with or contribute to the subsequent analysis. All solvent rinses used must be of pesticide grade quality. Finally, the DI water is organic-free reagent water. Analyte-free water may be used as deemed appropriate.

3.7.3 Sample Contaminant Sources and Other Potential Problems

Contaminant carryover between samples and/or from leaching of the sampling devices is very complex and requires special attention. Decisions concerning the appropriateness of the device's material composition must account for these carryover or leaching potentials and whether these contaminants are of concern on the project. Disposable equipment will be used for all sampling procedures.

3.8 HEALTH & SAFETY

The HASP (Appendix B) provides general H&S procedures applicable to sampling and analytical activities to be performed at all installations where MMRP SIs are being conducted by Malcolm Pirnie (within USACE, North and South Atlantic Divisions). The HASP sets forth

health and safety protocols to be used by Malcolm Pirnie employees and its subcontractors during field activities. All work will be in conformance with the HASP unless formally modified and approved by the Malcolm Pirnie UXOSS and reviewed by the Contracting Officer via a formal record of change. The intent of the HASP is to ensure the health and safety of all site personnel, the general public, and the environment. Although it is impossible to eliminate all risks, adherence to the HASP will help minimize incidents and accidents by promoting safety while maintaining productivity. It should be noted that the HASP may include discussions that are not applicable to a specific site since it is intended to encompass all sites.

It is intended that once the HASP is finalized, it will not be modified (except for programmatic changes) and will serve as a programmatic document. Site-specific sampling information and any exceptions or proposed changes to the HASP are addressed and included in the SSHP which is included as Attachment 1 to the HASP. The SSHP is not a stand-alone document from the HASP. The HASP will provide the majority of the H&S information; the SSHP simply supplements the information in the HASP by providing for site-specific condition requirements.

4 FIELD ACTIVITIES

The field activities that will be completed at each of the MRSs at FTSW in order to identify whether MEC and/or MC are present were determined using the TPP process. The determination of whether further investigation is required or if a NFA determination is appropriate for each MRS will be made using a weight of evidence approach. Examples of evidence that will be included in the decision making process include historical information, analytical results (screened against established background levels, and agreed upon regulatory limits), and field observations. A brief site description and the agreed upon MEC/MC field activities are presented below for each of the four MRSs. Map 2-1 shows the relative location of each MRS on the installation and the historical range fans that overlap and make up each of the FTSW MRSs.

4.1 ANTI – AIRCRAFT RANGE -4 (FTSW-009-R-01)

4.1.1 Site Description

The MRS layout and location are presented on **Map 4-1**. This MRS is a 661-acre parcel located in the northern portion of the cantonment area and was used for anti-aircraft range training from 1941 to 1964. The MRS is composed of the firing points of a total of three separate/collocated ranges. The combined acreage covered by these three historical ranges is 85,325 acres, 661 acres of which are not in the operational range area and, thus, overlap the other than operational area and make up Anti-Aircraft Range – 4. The boundary of the MRS was expanded southeast beyond the firing point area to include a currently undeveloped area where an EOD response was documented. Based on historical data reviewed for this HRR, the expected munitions use associated with this MRS includes 40mm and 90mm anti-aircraft projectiles. The following EOD responses occurred at the site: "40mm" projectile (along the northern boundary of the site), "mortar round" (western central section of the site), "M67" hand grenade (along the southeast boundary) and "2.75 rocket" (southern central section of the site). Additionally, one EOD response [labeled "EOD Response (no information)"] was reported along the southern boundary and northern central section of the site, details regarding the munitions items encountered were not available. Appendix E of this Work Plan includes the CSM developed for the Anti-Aircraft Range -4.

4.1.2 Proposed MEC/MC Activities

MEC Activities: Based on information presented in the HRR, the potential for MEC at the site exists; therefore, activities associated with MEC presence will be performed, including a magnetometer assisted visual survey during sample activities. A magnetometer assisted site walk will determine the presence of MEC on the site. Field personnel (escorted by a UXO Technician III) will traverse evenly spaced transects in order to complete the magnetometer assisted surface sweep/visual survey of 100% of the undeveloped area (approximately 20 acres). An MEC/Multiple Anomaly Discovery Sheet (Appendix D) will be completed if MEC or munitions debris are detected with the magnetometer. This site is recommended for RFI/CMS due to historical evidence of multiple overlapping range fans (Map 2-1) and multiple EOD responses.

MC Activities: Four discrete surface soil samples will be collected from randomly distributed locations unless biased locations are identified. Based on the historical layout and use of this MRS, berms or burial areas are not anticipated therefore only surface soil samples, at a depth of 0 – 6 inches, will be collected. Soil samples will be analyzed for aluminum, antimony, copper, lead, and zinc (USEPA Method 6010B) and explosives (USEPA Method 8330B modified). Data will be compared to FTSW inorganic/metal background values, USEPA Region 9 Residential RSLs, Region 4 Ecological Screening Values for Surface Soil, for metals and explosives. This site is recommended for RFI/CMS based on historical evidence of multiple overlapping range fans (Map 4-1) and multiple EOD responses.

4.2 ANTI – TANK RANGE 90MM -2

4.2.1 Site Description

The MRS layout and location are presented on **Map 4-2**. This 546-acre MRS is located in the northwestern portion of the cantonment area and was used for anti-tank, anti-aircraft, grenade launcher, and small arms training during the 1940s. The MRS is composed of eight range fans. The total acreage covered by the eight historical ranges is 17,015 acres, 546 acres of which overlap the other than operational area and make up Anti-Tank Range 90MM – 2. The MRS is composed of the firing point of two separate collocated ranges (Anti-Tank Range 90MM – 2 and

a 40mm anti-aircraft range) and the downrange area of six separate ranges (Ranges A, N, M, HBANM small arms range, grenade launcher range and a 120mm anti-aircraft range). The known munitions use associated with this MRS includes 40mm and 120mm anti-aircraft projectiles, 40mm grenades (practice), and 90mm anti-tank projectiles. No documentation of EOD responses was identified at this site. Appendix E of this Work Plan includes the CSM developed for the Anti-Tank Range- 90MM- 2.

4.2.2 Proposed MEC/MC Activities

MEC Activities: Based on information presented in the HRR, the potential for MEC at the site exists; therefore, activities associated with MEC presence will be performed, including a magnetometer assisted visual survey during sample activities. A magnetometer assisted site walk will determine the presence of MEC on the site. Field personnel (escorted by a UXO Technician III) will traverse evenly spaced transects in order to complete the magnetometer assisted surface sweep/visual survey of 10% of the undeveloped area (approximately 33 acres). An MEC/Multiple Anomaly Discovery Sheet (Appendix D) will be completed if MEC or munitions debris are detected with the magnetometer. This site is recommended for RFI/CMS due to historical evidence of multiple overlapping range fans (Map 2-1).

MC Activities: Four discrete surface soil samples will be collected. A minimum of two of the samples will be biased and collected from the firing points of the Anti-Tank 90MM Range and Anti-Anti-Aircraft 40MM ranges. The remaining two samples will be randomly distributed unless biased locations are identified. Based on the historical layout and use of this MRS, berms or burial areas are not anticipated therefore only surface soil samples, at a depth of 0 – 6 inches, will be collected. Soil samples will be analyzed for aluminum, antimony, copper, lead, and zinc (USEPA Method 6010B) and explosives (USEPA Method 8330B modified). Data will be compared to FTSW inorganic/metal background values, USEPA Region 9 Residential RSLs, Region 4 Ecological Screening Values for Surface Soil, for metals and explosives. This site is recommended for RFI/CMS based on historical evidence of multiple overlapping range fans (Map 4-2).

4.3 GRENADE LAUNCHER RANGE

4.3.1 Site Description

The MRS layout and location are presented on **Map 4-3**. This 132-acre MRS is located along the western perimeter of the cantonment area and was historically used as a grenade launcher range (practice), infiltration course, 120mm anti-aircraft range, and three small arms ranges during the 1940s. The total acreage covered by the six historical ranges is 10,947.6 acres, 132 acres of which overlap the other than operational range area and make up Grenade Launcher Range MRS. According to documents reviewed for the HRR, munitions used on the Grenade Launcher Range included 40mm practice grenades, small arms, and TNT. Archival documents from 1941 document the use of .30 caliber (cal) and .50 cal machine guns on FTSW. Therefore, it is assumed that .30 cal and .50 cal small arms were used on this MRS. Additionally, 120mm anti-aircraft projectile use occurred on approximately 15 acres of the MRS. No EOD responses have been reported for this MRS. Appendix E of this Work Plan includes the CSM developed for the Grenade Launcher Range.

4.3.2 Proposed MEC/MC Activities

MEC Activities: Based on information presented in the HRR, the potential for MEC at the site exists; therefore, activities associated with MEC presence will be performed, including a magnetometer assisted visual survey during sample activities. A magnetometer assisted site walk will determine the presence of MEC on the site. Field personnel (escorted by a UXO Technician III) will traverse evenly spaced transects in order to complete the magnetometer assisted surface sweep/visual survey of 10% of the undeveloped area (approximately 4 acres). An MEC/Multiple Anomaly Discovery Sheet (Appendix D) will be completed if MEC or munitions debris are detected with the magnetometer or if potential burial sites are found during the site walk. The FTSW DPW, USAEC, and USACE, Baltimore District will be notified if a MEC item is encountered during fieldwork.

MC Activities: Fourteen discrete surface soil samples will be collected at biased locations when possible or at random locations throughout the site. Based on the historical layout and use of this MRS, berms may be present. Three samples will be collected from locations of the berms from Ranges H, B, and A. Additionally, three samples will be collected from the firing point of the

120-MM Anti-Aircraft Range. Soil samples will be analyzed for aluminum, antimony, copper, lead, and zinc (USEPA Method 6010B) and explosives (USEPA Method 8330B modified). Data will be compared to FTSW inorganic/metal background values, USEPA Region 9 Residential RSLs, Region 4 Ecological Screening Values for Surface Soil, for metals and explosives. If MC results in all of the samples fall below the applicable screening standards, the site may be recommended for NFA, depending upon the results of the MEC investigation. This site is recommended for RFI/CMS based on historical evidence of multiple overlapping range fans (Map 4-3).

4.4 SMALL ARMS RANGE - 2

4.4.1 Site Description

The MRS layout and location are presented on **Map 4-4**. This 287-acre MRS is located along the western perimeter of the cantonment area and historically was used for small arms training during the 1940s and 1950s. The combined acreage of the overlapping range fans is 2,091 acres, 287 acres of which overlap the other than operational area and make up Small Arms Range – 2. The MRS is composed of the firing points of the four small arms ranges and the downrange area of Range M and HBANM Ranges. According to documents reviewed for the May, 2010, HRR, munitions used on the small arms range were .50 cal or less; however, the exact calibers are unknown. Archival documents from 1941 document the use of .30 cal and .50 cal machine guns on FTSW. Therefore, it is assumed that .30 cal and .50 cal small arms were used on this MRS. Two documented EOD responses were identified at the site. The first involved a 105mm projectile and occurred in April 2003. The second occurred in 2008; however, the munitions item encountered was not documented. Appendix E of this Work Plan includes the CSM developed for the Small Arms Range- 2.

4.4.2 Proposed MEC/MC Activities

MEC Activities: No MEC field activities are recommended for this MRS because historical evidence suggests only small arms were used at this MRS.

MC Activities: A visual survey, escorted by a UXO Technician III, will be completed to identify any berms on site. Ten discrete surface soil samples will be collected throughout the site. Eight of the ten samples will be collected from Range N. Two samples will be collected from the location of each of the four firing positions/berms on Range N. The remaining two samples will be randomly distributed unless biased locations are identified. All samples will be analyzed for lead using USEPA Method 6010B. Data will be compared to the FTSW background value and then the USEPA Region 9 Residential RSL, Region 4 Ecological Screening Values for surface soil. This site is recommended for RFI/CMS based on historical evidence of multiple overlapping range fans (Map 4-4).

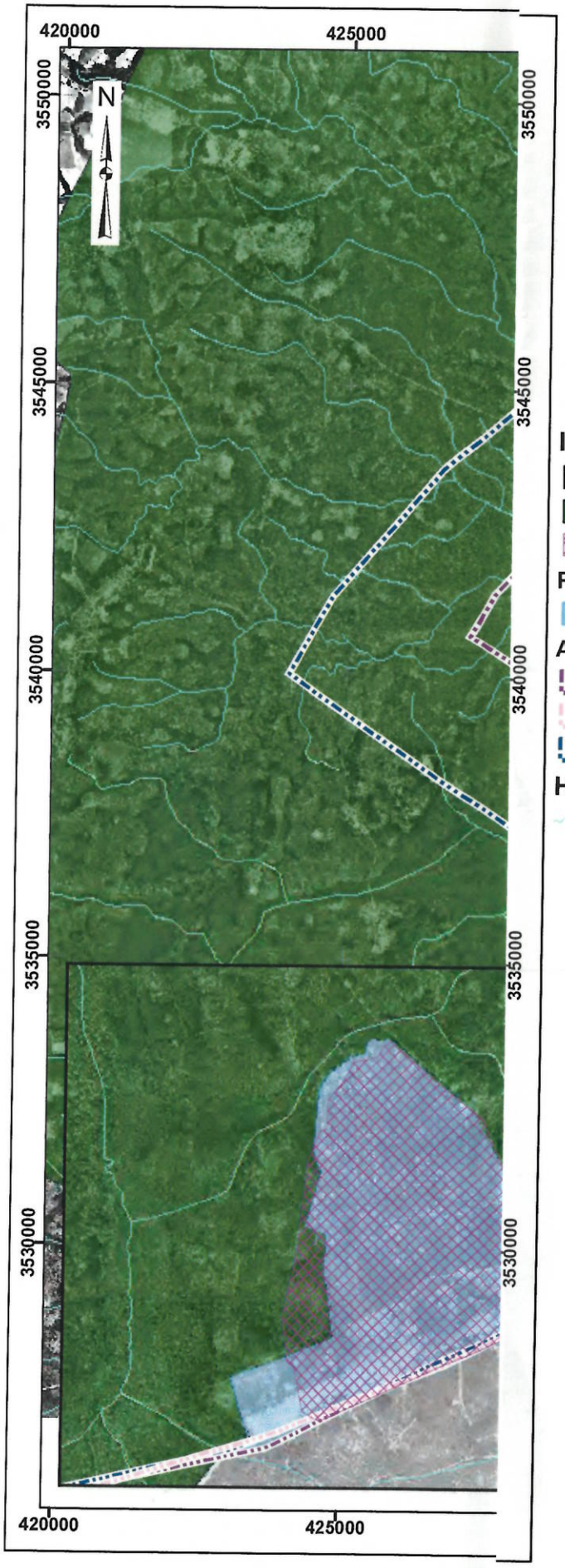
4.5 SUMMARY OF FIELD ACTIVITIES

The total number of field samples that will be collected and the selected laboratory analyses are presented in **Table 4-1** below.

Table 4-1: Field Sample Summary Table

MRS	Number of Field Samples/Analysis							
	Metals (6010B)				Explosives (8330B modified)			
	Surface Soil				Surface Soil			
Sample Type	Field Sample	Duplicate Field Sample	MS	MSD	Field Sample	Duplicate Field Sample	MS	MSD
Anti – Aircraft Range – 4[1]	4	1	0	0	4	1	0	0
Anti – Tank Range 90mm – 2[1]	4	0	0	0	4	0	0	0
Grenade Launcher Range[1]	14	1	1	1	14	1	1	1
Small Arms Range – 2[2]	10	1	1	1	0	0	0	0
Total Analysis	39				26			

1 Metals analysis includes: aluminum, antimony, copper, lead, and zinc by USEPA Method 6010B.
2 Metals analysis includes: lead by USEPA Method 6010B.



Phase 2 Confirmatory Sampling Work Plan Fort Stewart, GA

MALCOLM PIRNIE

Map 4-1
Anti-Aircraft Range - 4

Legend

Installation Data

- Other than Operational Area
- Operational Area
- Developed Area

Phase 2 MRS (Other than Operational Area)

- Anti-Aircraft Range - 4

Anti-Aircraft Range 90-MM - 2 Historical Fans

- 90-mm Anti-Aircraft (C Range) 1957,1962,1964
- 40-mm Anti-Aircraft (C 40-mm 11850 YRDS) 1941
- 90-mm Anti-Aircraft (C 90-mm 20500 YRDS) 1941

Hydrology

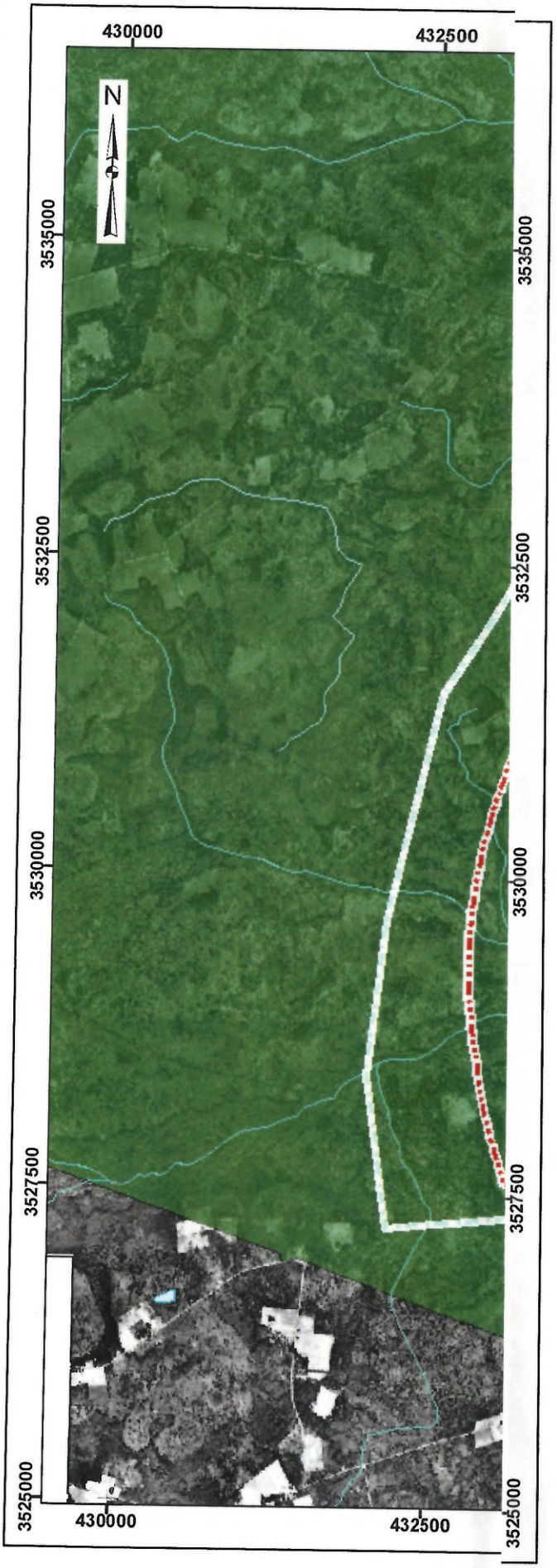
- River/Stream

0 2,000 4,000 Meters

Data Source: Fort Stewart, GA

Coordinate System: UTM Zone 17N
Datum: NAD83
Units: Meters

Contract: DACA31-05-D-0043
Edition: Stakeholder Draft
Date: May 2010



Phase 2 Confirmatory Sampling Work Plan Fort Stewart, GA

MALCOLM PIRNIE

Map 4-2
Anti-Tank Range 90-MM - 2

Legend

Installation Data
- Other than Operational Area
- Operational Area

Phase 2 MRS (Other than Operational Area)
- Small Arms Range - 2
- Anti-Tank Range 90-MM - 2
- Anti-Aircraft Range - 4
- Grenade Launcher Range

Phase 1 MRS
- Anti-Tank Range 90-mm

Anti-Tank Range 90-MM - 2 Historical Fans
- Anti-Tank (E 90-mm 14540 yards) 1941
- 40-mm Anti-Aircraft (E 40-mm 8500 YRDS) 1941
- 120-mm Anti-Aircraft

Small Arms Range - 2 Historical Range Fans
- Small Arms 1944
- Small Arms (HBANM RANGES) 1940
- Grenade Launcher Range

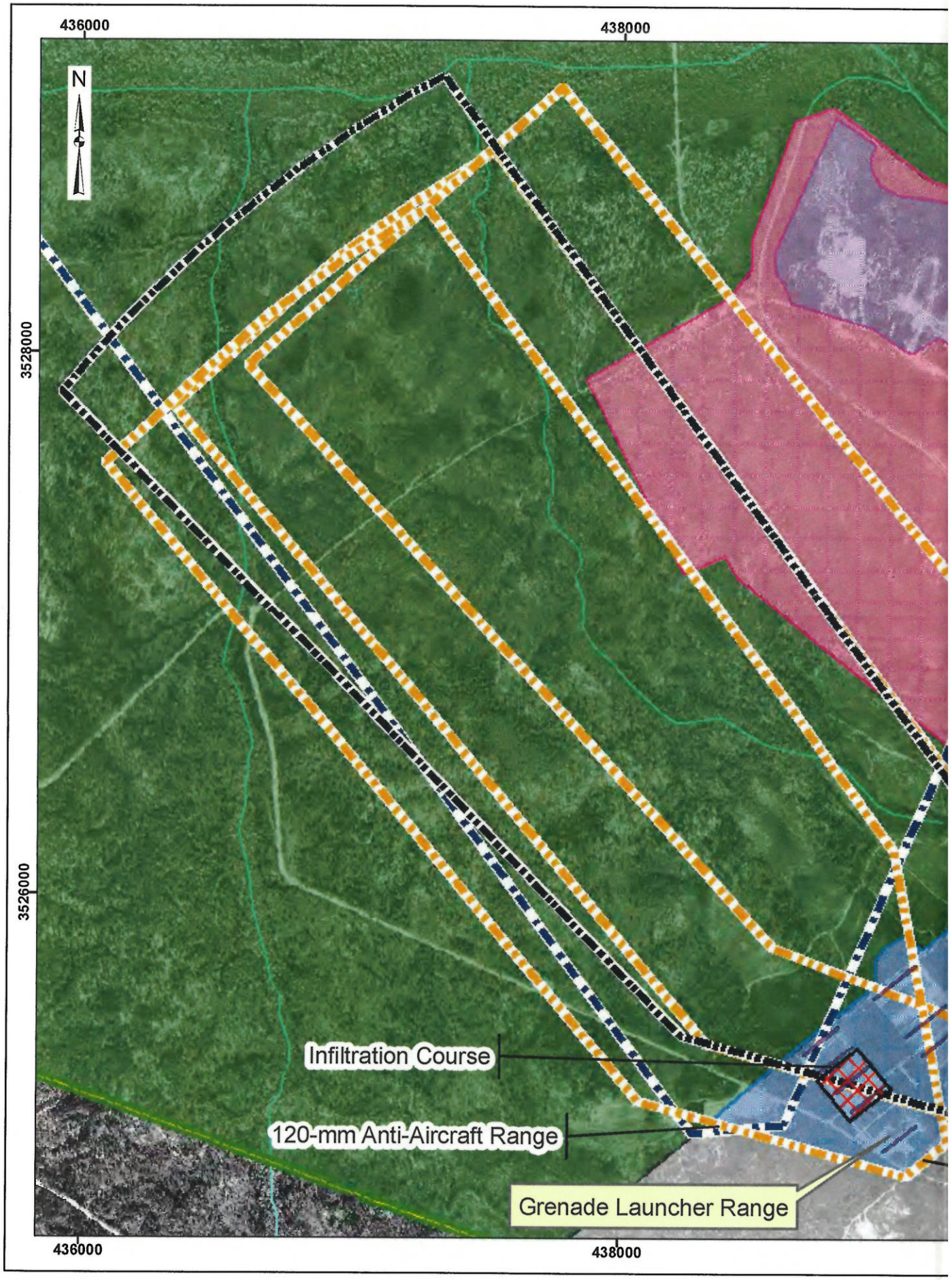
Hydrology
- River/Stream
- Water Body

0 1,000 2,000 Meters

Data Source: Fort Stewart, GA

Coordinate System: UTM Zone 17N
Datum: NAD83
Units: Meters

Contract: DACA31-05-D-0004
Edition: Stakeholder Draft
Date: May 2010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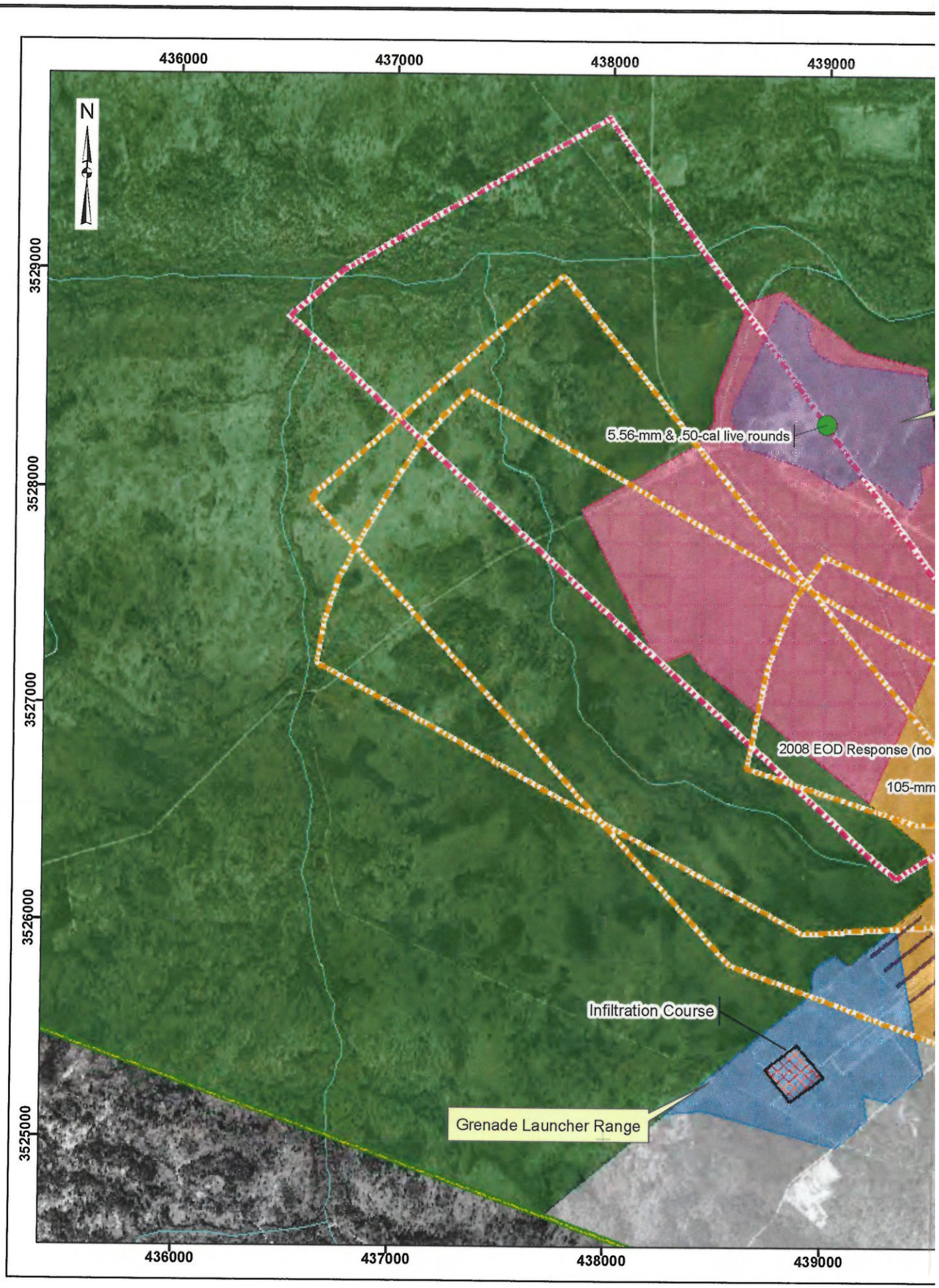
438000
N
3528000
3526000
Infiltration Course
120-mm Anti-Aircraft Range
Grenade Launcher Range
436000
438000


436000
437000
438000
439000
N
3529000
3528000
3527000
3526000
3525000
5.56-mm & .50-cal live rounds
2008 EOD Response (no
105-mm
Infiltration Course
Grenade Launcher Range

5 SAMPLE MANAGEMENT AND ANALYSIS

5.1 FIELD OPERATIONS DOCUMENTATION

Field documentation of the samples taken is of the utmost importance in assuring QC. Field documentation will include DQCRs, field notebooks, sample labels, and COC forms. All field documentation will be completed in indelible ink. Corrections will be made by drawing a single line through the text and legibly writing the correction.

5.2 DQCR

As described in the QAPP, the DQCR will be prepared by the FPM each day that fieldwork is performed, commencing with the first day work is performed on-site. All workdays will be documented in this report throughout the duration of the fieldwork. Malcolm Pirnie will provide DQCRs to the USACE, Baltimore District PM in the CS Report. A sample DQCR form is included in Field Forms in Appendix D.

5.3 FIELD NOTEBOOKS

Field notes regarding all sampling and field activities will be kept in a bound notebook with pre-numbered pages. Indelible ink will be used for all entries. The field notes will be filled out while the fieldwork is taking place and will include all of the information that is reported on the DQCR forms.

5.4 SAMPLE NUMBERING SCHEME

All samples taken will employ the USACE Laboratory numbering system. This system assures that QC checks originating from the field are blind to the laboratory and that a uniform and consistent numbering system is employed in the field.

All samples collected as part of this CS Report will utilize the following standard designation format:

FTSW- [Sample media] - [Location designation] - [sample date (month) (day) (year)]

SS will be used to designate a surface soil sample (e.g., FTSW-SS-22-080104).

All duplicate samples collected will utilize the following standard designation format:
FTSW - [Sample media] - [Location designation/DUP] - [sample date (month)(day)(year)]
(e.g., FTSW-S-22/DUP-080104)

All MS/MSD samples collected will utilize the following standard designation format:
FTSW - [Sample media] - [Location designation/MSD] - [sample date (month)(day)(year)]
(e.g., FTSW-SS-22/MSD-080104)

All equipment blank samples collected will utilize the following standard labeling format:
FTSW - [Sample media] - [Location designation/EB] - [sample date (month)(day)(year)]
(e.g., FTSW-SS-22/EB-080104)

5.5 SAMPLE LABELS

Correct sample labeling and the corresponding notation of the sample identification numbers in the field notebook, DQCR, and on the COC forms will be utilized to prevent misidentification of samples and their eventual results. All sample labels will be completed legibly with indelible ink. The labels will be affixed to the sample bottle and covered with clear tape.

At a minimum, the sample labels will include the following:

a. Project name
b. Company name
c. Name/initials of the collector
d. Date and time of collection
e. Sample location and depth
f. Analysis required
g. Preservatives added
h. Matrix

5.6 COC

The COC procedures will be in accordance with USACE Sample Handling Protocol and USEPA procedures. COC procedures are used to document and track samples from collection through reporting of analytical results and to serve as permanent records of sample handling and shipment. Strict COC protocol will be maintained for all samples collected during this project. The COC forms will be filled out with indelible ink by the FPM, and any mistakes made will be crossed out with a single line and initialed and dated.

The information on the COC form will include the following:

a. Sample identification numbers
b. Date and time of sample collection
c. Project name and number
d. Number of sample containers
e. Analyses required including method number
f. Turn-around time required
g. Preservatives used
h. Signatures of all parties who had possession of the samples
i. Matrix

COC forms will be completed for every cooler and will be sealed in a resealable bag and taped to the inside of the lid of the cooler. The FPM will keep one copy of the COC form. The laboratory will then sign the COC form upon accepting the samples for analysis. Copies of the COC forms will be included in the CS Report as an appendix and given to the USACE, Baltimore District PM upon completion of the field sampling effort.

5.7 Sample Packaging and Shipping Requirements

Custody of samples must be maintained throughout the shipment of samples to the selected laboratory. The following procedures will be used to send samples to be analyzed for explosives and metals to the laboratory:

- Use waterproof high strength plastic ice chests or coolers only.

- After filling out the pertinent information on the sample label and tag, put the sample in the container and screw on the lid. Secure the bottle lid with strapping tape.
- Tape cooler drain shut.
- Place about 3 inches of inert cushioning material, such as vermiculite or Styrofoam "popcorn", in the bottom of the cooler.
- Enclose the containers in clear plastic bags through which sample labels are visible, and seal the bag. Place containers upright in the cooler in such a way that they do not touch and will not touch during shipment.
- Put in additional inert packing material to partially cover sample containers (more than halfway). Place bags of ice or ice gel packs around, among, and on top of the sample containers.
- Fill the remaining space in the cooler with cushioning material.
- If sending the samples by common carrier, sign the COC form under "Relinquished by," enter the carrier name and air bill number, retain a copy for field records, put the COC record in a waterproof plastic zip top bag and tape it with masking tape to the inside lid of the cooler.
- If sending the samples by courier or field team shipper, follow the above procedures, but also have the receiving carrier sign under "Received by."
- Apply custody seals to the front and back of the cooler, across the lid.
- Secure lid by taping. Wrap the cooler completely with strapping tape at a minimum of two locations. Do not cover any labels.
- Attach completed shipping label to top of the cooler. The shipping label will have a return address.
- Ship the cooler by overnight express or courier to the respective laboratory.

The primary laboratory address and POC are noted below:

Katahdin Analytical Services
600 Technology Way
Scarborough, ME 04074
ATTN: Kate Zaleski/Sample Custodian
Phone: (207) 874-2700 x17
Fax: (207) 775-4029

A secondary laboratory (i.e., back-up) has been selected for the MMRP investigations, which can meet the analytical requirements of this program. The secondary laboratory, which is noted below, will analyze samples ONLY in instances when Katahdin Analytical Services cannot.

Analytical Laboratory Services, Inc.
34 Dogwood Lane
Middletown, PA 17057
ATTN: Tonya Hironimus/Sample Custodian
Phone: (717) 944-5541
Fax: (717) 944-1430

5.8 INVESTIGATIVE DERIVED WASTE (IDW)

IDW will not require containerizing or special disposal procedures. Soil cuttings and excess sample material will be returned to the sample hole or boring for backfill purposes immediately after completion of sampling.

Decontamination fluids are not expected since dedicated/disposable field sampling equipment will be used. Used gloves, core liners, and any other disposable sampling equipment or personal protective equipment will be double bagged and disposed of off-site as non-hazardous waste.

6 REFERENCES

Malcolm Pirnie, Inc. Quality Assurance Program Plan, MMRP SI. July 2004.

Malcolm Pirnie, Inc. Final Phase 2 Historical Records Review, Fort Stewart, Georgia. May 2010.

U.S. Environmental Protection Agency. Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. USEPA-540-R-03-001. Technical Review Workgroup for Lead, Washington, D.C. January 2003.

U.S. Environmental Protection Agency. Region 9, Regional Screening Levels Table. 2008.

Appendix A: Quality Assurance Program Plan

STAKEHOLDER DRAFT

PHASE 2 WORK PLAN

UNIFORM FEDERAL POLICY-QUALITY ASSURANCE PROJECT PLAN CONFIRMATORY SAMPLING REPORT FORT STEWART, GEORGIA

MAY 2010

Prepared for:

UNITED STATES ARMY CORPS OF ENGINEERS, BALTIMORE DISTRICT
P.O. Box 1715
Baltimore, Maryland 21203-1715

Prepared by:

MALCOLM PIRNIE, INC.
300 East Lombard Street, Suite 1510
Baltimore, Maryland 21202

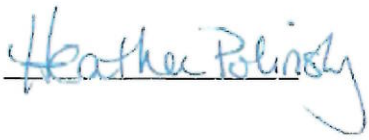
STAKEHOLDER DRAFT

PHASE 2 WORK PLAN

UNIFORM FEDERAL POLICY-QUALITY ASSURANCE PROJECT PLAN CONFIRMATORY SAMPLING REPORT FORT STEWART, GEORGIA

DoD Contract Number: W912DR-09-D-0016

Reviewed and Approved by:



Heather Polinsky, Vice President
Program Officer
Malcolm Pirnie, Inc.

Shelly Kolb
Project Manager
Malcolm Pirnie, Inc.

MAY 2010

TABLE OF CONTENTS

ACRONYMS

Acronym	Definition
µg/kg	microns per kilogram
CA	Corrective Action
CAR	Corrective Action Report
CFR	Code of Federal Regulations
CMS	Corrective Measures Study
CS	Confirmatory Sampling
CTC	Cost to Complete
DQCR	Daily Quality Control Report
DQI	Data Quality Indicator
DQO	Data Quality Objective
EOD	Explosive Ordnance Disposal
ERIS	Environmental Restoration Information System
FTSW	Fort Stewart
GAEPD	Georgia Environmental Protection Division
GIS	Geographic Information System
GPS	Global Positioning System
HRR	Historical Records Review
MC	Munitions Constituents
MDL	Method Detection Limit
MEC	Munitions and Explosives of Concern
MMRP	Military Munitions Response Program
MRS	Munitions Response Site
MS/MSD	Matrix Spike/Matrix Spike Duplicate
N/A	Not Applicable
NFA	No Further Action
PM	Project Manager
POC	Point of Contact
PQO	Project Quality Objective
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QL	Quantization Limit
RCRA	Resource Conservation and Recovery Act
RL	Reporting Limit
RSL	Regional Screening Levels
SI	Site Inspection
SOP	Standard Operating Procedure
TCL	Target Compound List
TPP	Technical Project Planning
UFP	Uniform Federal Poicy
U.S.	United States
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Command
USEPA	United States Environmental Protection Agency

QAPP Worksheet # 1 Title and Approval Page
(UFP-QAPP Section 2.1)

Site Name/Project Name: Phase 2 Confirmatory Sampling (CS) Report, Fort Stewart (FTSW), Georgia
Site Location: FTSW, Georgia

Document Title: Uniform Federal Polic (UFP) Quality Assurance Project Plan (QAPP), Confirmatory Sampling Report, Fort Stewart, Georgia.

Lead Organization: United States (U.S.) Army Corps of Engineers (USACE), Baltimore District

Preparer's Name and Organizational Affiliation: Rosemarie Fehrman, Malcolm Pirnie, Inc.

Preparer's Address, Telephone Number, and E-mail Address: 300 E. Lombard St., Suite 1510, Baltimore, Maryland, 21202, (410) 332-4808, rfehrman@pirnie.com

Preparation Date (Day/Month/Year): 05/04/2010

Investigative Organization's Project Manager (PM): Shelly L. Kolb
Signature

Printed Name/Organization: Shelly Kolb / Malcolm Pirnie, Inc.

Heather Polinsky

Investigative Organization's Project QA Officer: _____
Signature

Printed Name/Organization: Heather Polinsky, Vice President / Malcolm Pirnie, Inc.

Document Control Numbering System: 2118-162

QAPP Worksheet # 2 QAPP Identifying Information
(UFP-QAPP Section 2.2.4)

Site Name/Project Name: Phase 2 CS Report, FTSW
Site Location: Fort Stewart, Georgia
Site Number/Code: Not applicable (N/A)
Operable Unit: N/A
Contractor Name: Malcolm Pirnie, Inc.
Contract Number: W912DR-09-D-0016
Delivery Order: 0004

Title: Draft UFP QAPP
Revision Number: 0
Revision Date: 5/4/10
Page 3 of 50

1. Identify regulatory program: Military Munitions Response Program (MMRP)
2. Identify approval entity: Georgia Environmental Protection Division (GAEPD)
3. The QAPP is (select one): ☐Generic ☒Project Specific
4. List dates of scoping sessions that were held:
   - 12 August 2009
   - 29 April 2010
5. List dates and titles of QAPP documents written for previous site work, if applicable:
   N/A
6. Lead Regulatory Stakeholders: Georgia Environmental Protection Division (GAEPD)
   Other Regulatory Stakeholders: N/A
   Army Stakeholders: USACE Baltimore District; U.S. Army Environmental Command (USAEC); and FTSW
7. List data users: USACE, USAEC, GAEPD, FTSW, and Malcolm Pirnie
8. If any required QAPP elements and required information are not applicable to the project, then circle the omitted QAPP elements and required information on the attached table. Provide an explanation for their exclusions below:

   All QAPP worksheets are applicable.

QAPP Worksheet #2
QAPP Identifying Information
(continued)

Identify where each required QAPP element is located in the QAPP (provide section, worksheet, table, or figure number) or other project planning documents (provide complete document title, date, section number, page numbers, and location of the information in the document). Type "NA" for the QAPP elements that are not applicable to the project. Provide an explanation in the QAPP.

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to Related Documents
Project Management and Objectives		
2.1 Title and Approval Page	- Title and Approval Page	Title Page
2.2 Document Format and Table of Contents 2.2.1 Document Control Format 2.2.2 Document Control Numbering System 2.2.3 Table of Contents 2.2.4 QAPP Identifying Information	- Table of Contents - QAPP Identifying Information	Worksheets #1 and #2
2.3 Distribution List and Project Personnel Sign-Off Sheet 2.3.1 Distribution List 2.3.2 Project Personnel Sign-Off Sheet	- Distribution List - Project Personnel Sign-Off Sheet	Worksheets #3 and #4
2.4 Project Organization 2.4.1 Project Organizational Chart 2.4.2 Communication Pathways 2.4.3 Personnel Responsibilities and Qualifications 2.4.4 Special Training Requirements and Certification	- Project Organizational Chart - Communication Pathways - Personnel Responsibilities and Qualifications Table - Special Personnel Training Requirements Table	Worksheets #5-8
2.5 Project Planning/Problem Definition 2.5.1 Project Planning (Scoping) 2.5.2 Problem Definition, Site History, and Background	- Project Planning Session Documentation (including Data Needs tables) - Project Scoping Session Participants Sheet - Problem Definition, Site History, and Background - Site Maps (historical and present)	Worksheets #9 and #10 Work Plan Section 3.4
2.6 Project Quality Objectives (PQO) and Measurement Performance Criteria 2.6.1 Development of PQO Using the Systematic Planning Process 2.6.2 Measurement Performance Criteria	- Site-Specific PQOs - Measurement Performance Criteria Table	Worksheets #11-12

QAPP Worksheet #2
QAPP Identifying Information
(continued)

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to Related Documents
2.7 Secondary Data Evaluation	- Sources of Secondary Data and Information - Secondary Data Criteria and Limitations Table	Worksheet #13
2.8 Project Overview and Schedule 2.8.1 Project Overview 2.8.2 Project Schedule	- Summary of Project Tasks - Reference Limits and Evaluation Table - Project Schedule/Timeline Table	Worksheets #14-16
Measurement/Data Acquisition		
3.1 Sampling Tasks 3.1.1 Sampling Process Design and Rationale 3.1.2 Sampling Procedures and Requirements 3.1.2.1 Sampling Collection Procedures 3.1.2.2 Sample Containers, Volume, and Preservation 3.1.2.3 Equipment/Sample Containers Cleaning and Decontamination Procedures 3.1.2.3 Field Equipment Calibration, Maintenance, Testing, and Inspection Procedures 3.1.2.4 Supply Inspection and Acceptance Procedures 3.1.2.6 Field Documentation Procedures	- Sampling Design and Rationale - Sample Location Map - Sampling Locations and Methods/Standard Operating Procedures (SOP) Requirements Table - Analytical Methods/SOP Requirements Table - Field Quality Control (QC) Sample Summary Table - Sampling SOPs - Project Sampling SOP References Table - Field Equipment Calibration, Maintenance, Testing, and Inspection Table	Worksheets #17-22 Work Plan Apendices
3.2 Analytical Tasks 3.2.1 Analytical SOPs 3.2.2 Analytical Instrument Calibration Procedures 3.2.3 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Procedures 3.2.4 Analytical Supply Inspection and Acceptance Procedures	- Analytical SOPs - Analytical SOP References Table - Analytical Instrument Calibration Table - Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	Worksheets #23-25

QAPP Worksheet #2
QAPP Identifying Information
(continued)

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to Required Documents
3.3 Sample Collection Documentation, Handling, Tracking, and Custody Procedures 3.3.1 Sample Collection Documentation 3.3.2 Sample Handling and Tracking System 3.3.3 Sample Custody	- Sample Collection Documentation Handling, Tracking, and Custody SOPs - Sample Container Identification - Sample Handling Flow Diagram - Example Chain-of-Custody Form and Seal	Worksheets #26-27
3.4 Quality Control Samples 3.4.1 Sampling Quality Control Samples 3.4.2 Analytical Quality Control Samples	- QC Samples Table - Screening/Confirmatory Analysis Decision Tree	Worksheet #28
3.5 Data Management Tasks 3.5.1 Project Documentation and Records 3.5.2 Data Package Deliverables 3.5.3 Data Reporting Formats 3.5.4 Data Handling and Management 3.5.5 Data Tracking and Control	- Project Documents and Records Table - Analytical Services Table - Data Management SOPs	Worksheets #29-30
Assessment/Oversight		
4.1 Assessments and Response Actions 4.1.1 Planned Assessments 4.1.2 Assessment Findings and Corrective Action Responses	- Assessments and Response Actions - Planned Project Assessments Table - Audit Checklists - Assessment Findings and Corrective Action Responses Table	Worksheets #31-32
4.2 Quality Assurance Management Reports	- QA Management Reports Table	Worksheet #33
4.3 Final Project Report		

QAPP Worksheet #2
QAPP Identifying Information
(continued)

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to Related Documents
Data Review		
5.1 Overview		
5.2 Data Review Steps 5.2.1 Step I: Verification 5.2.2 Step II: Validation 5.2.2.1 Step IIa Validation Activities 5.2.2.2 Step IIb Validation Activities 5.2.3 Step III: Usability Assessment 5.2.3.1 Data Limitations and Actions from Usability Assessment 5.2.3.2 Activities	- Verification (Step I) Process Table - Validation (Steps IIa and IIb) Process Table - Validation (Steps IIa and IIb) Summary Table - Usability Assessment	Worksheets #34-37
5.3 Streamlining Data Review 5.3.1 Data Review Steps To Be Streamlined 5.3.2 Criteria for Streamlining Data Review 5.3.3 Amounts and Types of Data Appropriate for Streamlining	N/A	N/A

QAPP Worksheet # 3 Distribution List
(UFP-QAPP Manual Section 2.3.1)

List those entities to whom copies of the approved QAPP, subsequent QAPP revisions, addendums, and amendments will be sent.

☐ Worksheet Not Applicable (State Reason)

QAPP Recipients	Title	Organization	Telephone Number	Email Address
Mohamed Ghazi	Geologist	GAEPD	404-656-2833	Mo.ghazi@gaepd.org
William Powell	Engineer	GAEPS	404-656-2833	will_powell@dnr.state.ga.us
Algeana Stevenson	Installation Restoration Program Manager	FTSW	912-315-5144	Algeana.stevenson@us.army.mil
Marc Randrianarivelo	PM	USACE	410-320-9522	marc.randrianarivelo@usace.army.mil
Zsolt Haverland	Technical Manager	USACE	912-652-5815	Zsolt.e.haverland@usace.army.mil
Alan Freed	MMRP PM	USAEC	410-436-0498	Alan.freed@us.army.mil

QAPP Worksheet # 4 Project Personnel Sign-Off Sheet
(UFP-QAPP Manual Section 2.3.2)

Project Personnel	Title	Organization	Signature	Date QAPP Read
Mohamed Ghazi	PM	GAEPD		
Algeana Stevenson	Installation Restoration Program Manager	FTSW		
Marc Randrianarivelo	PM	USACE		
Zsolt Haverland	Technical Manager	USACE		
Alan Freed	MMRP PM	USAEC		
Heather Polinsky	Program Manager	Malcolm Pirnie, Inc.		
Shelly Kolb	PM	Malcolm Pirnie, Inc.		

QAPP Worksheet # 5 Project Personnel
(UFP-QAPP Manual Section 2.4.1)

Project personnel are outlined in Section 1.2.2 in the CS Work Plan.

QAPP Worksheet # 6 Communication Pathways
(UFP-QAPP Manual Section 2.4.2)

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Approval of amendments to the QAPP	Malcolm Pirnie	Shelly Kolb, PM	410-230-9958	Obtain initial verbal/email approval from the USACE PM. Submit documented amendment(s) within 10 working days for transmittal to USACE for written approval.
Stop work and initiation of corrective action	Malcolm Pirnie	Field team (To Be Announced)	410-230-9958	Communicate with the PM and Unexpolded Ordnance (UXO) Technical Lead within 24 hours of the stop work. Communicate to the project organization with a confirming email.
Reporting of Serious Issues	Malcolm Pirnie	Shelly Kolb, PM	410-230-9958	The PM will report any serious issues to the USACE PM and other concerned parties by email or memo.
Meeting minutes	Malcolm Pirnie	Shelly Kolb, PM	410-230-9958	The PM will post approved meeting minutes or distribute by email within 5 working days.
Corrective Action, Audit Finding	Malcolm Pirnie	Field team	410-230-9958	Problems or negative audit finding will be reported to the PM or UXO Technical Lead within 3 days
Review Comments	Malcolm Pirnie	Shelly Kolb, PM	410-230-9958	The PM will review comments and prepare a response to comments document and submit it to the USACE PM.
Initiation of Project Work Elements	Malcolm Pirnie	Shelly Kolb, PM	410-230-9958	The PM will notify the USACE PM via email or letter when each work element is about to commence.
Project Status Briefing	Malcolm Pirnie	Shelly Kolb, PM	410-230-9958	The PM will brief the USACE PM and FTSW a minimum of once per month regarding the status of project.
Communication with Regulators	Malcolm Pirnie	Shelly Kolb, PM	410-230-9958	The PM will provide copies of project correspondence and synopses of phone conversations with regulators to the USACE PM and FTSW PM in a timely manner.

QAPP Worksheet # 7 Personnel Responsibilities and Qualification Table (UFP-QAPP Manual Section 2.4.3)

Personnel responsibilities are discussed in Section 1.2.2 of the CS Work Plan.

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
Mohamed Ghazi	PM	GAEPD	PM; Reviews Work Plan	Regulator with experience in regulatory oversight of numerous MMRP sites
Algeana Stevenson	Installation Restoration Program Manager	FTSW	Installation Point of Contact (POC); Reviews Work Plan	PM with experience in coordination for environmental projects
Marc Randrianrivelo	PM	USACE	PM; Reviews Work Plan and coordinates project	PM with experience in overseeing MMRP projects for USACE, Baltimore District
Zsolt Haverland	Technical Manager	USACE	PM; Reviews Work Plan	PM with experience in overseeing MMRP projects for USACE, Savannah District
Alan Freed	MMRP PM	USAEC	PM; Reviews Work Plan	PM with experience in overseeing projects for USAEC
Heather Polinsky	Program Manager	Malcolm Pirnie, Inc.	See Section 1.2.2.1 of the CS Work Plan.	Vice President responsible for Federal Programs at Malcolm Pirnie; experience as Program Officer for many MMRP projects
Charles Myers	Corporate Health and Safety	Malcolm Pirnie, Inc.	See Section 1.2.2.1 of the CS Work Plan.	Experience with MMRP projects for the Army where responsible for health and safety aspects of the project; Health and Safety Director for Malcolm Pirnie's Health and Safety Program
Shelly Kolb	Project Manager	Malcolm Pirnie, Inc.	See Section 1.2.2.1 of the CS Work Plan.	PM with experience with MMRP projects for the Army
Rosemarie Fehrman	Field Team Leader	Malcolm Pirnie, Inc.	See Section 1.2.2.1 of the CS Work Plan.	Experience in field sampling for MMRP projects
George Overby	UXO Technical Lead	Malcolm Pirnie, Inc.	See Section 1.2.2.1 of the CS Work Plan.	Experience with planning, execution, and oversight of large field MMRP programs
Marla Miller	Chemist	Malcolm Pirnie, Inc.	See Section 1.2.2.1 of the CS Work Plan.	Chemist with experience in USACE projects

QAPP Worksheet # 8 Special Personnel Training Requirements Table
(UFP-QAPP Manual Section 2.4.4)

All Malcolm Pirnie staff who work at a known or potentially hazardous waste site are required to meet the safety and health training requirements of Title 29, Code of Federal Regulations (CFR) Part 1910.120(e). Copies of Malcolm Pirnie staff safety and health training records are available in the company files.

Project Function	Specialized Training – Title or Description of Course	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates
On-Site Personnel / UXO Team / Field Data Collection	Safety and Occupational Safety and Health Administration required training as specified in the Health and Safety Plan (CS Work Plan, Appendix B)	Certified instructors	Training dates are kept in company/project training records.	All field team members working on site	All Malcolm Pirnie personnel working on site	Malcolm Pirnie company / project files

QAPP Worksheet # 9 Project Scoping Session Participants Sheet (UFP-QAPP Manual Section 2.5.1)

Meeting minutes are included in Appendix C of the CS Work Plan.

Project Name: Fort Stewart Phase 2 HRR/CS **Projected Date(s) of Sampling:** 7/19/2010 **Project Manager:** Shelly Kolb	**Site Location:** Fort Stewart, Georgia

Date of Session: 12 August 2009
Scoping Session Purpose: Kickoff Meeting

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Mohamed Ghazi	PM	GAEPD	912-652-5815	Mo.ghazi@gaepd.org	GAEPD PM
Algeana Stevenson	Installation Restoration Program Manager	FTSW	912-315-5144	Algeana.stevenson@us.army.mil	FTSW PM
Marc Randrianarivelo	PM	USACE	410-320-9522	marc.randrianarivelo@usace.army.mil	USACE POC
Zsolt Haverland	Technical Manager	USACE	912-652-5815	Zsolt.e.haverland@usace.army.mil	USACE PM
Brian Greer	Cultural Resources Program Manager	FTSW	912-767-0992	Brian.greer@us.army.mil	FTSW
Shelly Kolb	Project Manager	Malcolm Pirnie	410- 230-9958	skolb@pirnie.com	PM
George Overby	UXO PM	Malcolm Pirnie	864-399-9902	goverby@pirnie.com	UXO PM
Carla Fereday	Engineer	Malcolm Pirnie	410-230-9953	cfereday@pirnie.com	Deputy PM

Consensus Decisions:

1. The Phase I Site Inspection was performed following Resource Conservation and Recocery Act (RCRA). It was agreed that this Phase II Site Inspection would mirror Phase I and also follow RCRA. The main document generated for this project will be entitled Confirmatory Sampling Report in place of the Site Inspection Report.
2. The deliverables (Historical Records Review, Work Plan) for this project will be a stand-alone document in lieu of addenda to the Phase I documents.
3. All Geographic Information System (GIS) maps generated for the project will be created on aerial or satellite images. Topographic maps will not be used as base layer of maps created for this project.
4. As requested the report distribution will be as follows:
   a. GAEPD – 2 hardcopies (with 2 electronic)
   b. FTSW - 2 hardcopies (with 2 electronic)
   c. USACE - 3 hardcopies (with 3 electronic)

HRR – Historical Records Review

Project Name: Fort Stewart Phase 2 HRR/CS **Projected Date(s) of Sampling:** 7/19/2010 **Project Manager:** Shelly Kolb	**Site Location:** Fort Stewart, Georgia

Date of Session: 29 April 2010
TPP Session Purpose: Discussion of proposed CS field activities

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Mohamed Ghazi	PM	GAEPD	912-652-5815	Mo.ghazi@gaepd.org	GAEPD PM
Algeana Stevenson	Installation Restoration Program Manager	FTSW	912-315-5144	Algeana.stevenson@us.army.mil	FTSW PM
Marc Randrianarivelo	PM	USACE	410-320-9522	marc.randrianarivelo@usace.army.mil	USACE POC
Zsolt Haverland	Technical Manager	USACE	912-652-5815	Zsolt.e.haverland@usace.army.mil	USACE PM
Alan Freed	MMRP PM	USAEC	410-436-0498	Alan.freed@us.army.mil	USAEC PM
Amy Potter	Unit Coordinator	GAEPD	404-657-8662	Amy-potter@dnr.state.ga.us	GAEPD
Will Powell	Environmental Engineer	GAEPD	404-657-8680	William.powell@gaepd.org	GAEPD
Shelly Kolb	Project Manager	Malcolm Pirnie	410- 230-9958	skolb@pirnie.com	PM
Rosemarie Fehrman	Engineer	Malcolm Pirnie	410-332-4808	rfehrman@pirnie.com	Deputy PM

Comments/Decisions:

1. Construction of barracks and other buildings has begun in the Anti-Aircraft Area - 4. Algeana Stevenson will share new building footprint. Malcolm Pirnie will alter the Munitions and Explosives of Concern (MEC) investigation plans based on this new footprint.
2. The Fire Station Berm, within the Small Arms Range-2, is currently under a Time Critical Removal Action. Field activities will be focused on areas outside of the previously investigated Fire Station Berm.
3. All sampling conducted will be discrete samples, not composite samples.
4. Regulatory criteria for the site will be changed to Regional Screening Levels (RSL) from Preliminary Remediation Goals. All revised regulatory criteria will need to be verified based on current and future land use. Background, as noted in the presentation, will also be used as a comparison value.
5. As a result of several factors (Explosive Ordnance Disposal [EOD] team turnover, record keeping procedures etc.) detailed information regarding EOD responses is limited. All available information was included in the HRR.
6. Quality Control samples will be collected at a 10% frequency.
7. In an effort to meet original schedule goals the Internal Army Draft CS Work Plan review will not be conducted. The Stakeholder Draft Work Plan will be submitted for Army and regulatory review.

Action Items:

1. GAEPD will send Algeana Stevenson comments on the HRR early in the week of 3 May 2010.
2. Malcolm Pirnie will submit the Final HRR and Stakeholder Draft CS Work Plan in May, 2010.

QAPP Worksheet # 10 Problem Definition
(UFP-QAPP Manual Section 2.5.2)

Clearly define the problem and the environmental questions that should be answered for the current investigation and develop the project decision "If..., then..." statements in the QAPP, linking data results with possible actions. The prompts below are meant to help the project team define the problem. They are not comprehensive.

☐ Worksheet Not Applicable (State Reason)

The problem to be addressed by the project: The primary goal of a MMRP CS is to collect information necessary to make one of the following decisions: 1) whether a RCRA Facilities Investigation (RFI)/Corrective Measures Study (CMS) is required at a Munitions Response Sites (MRS); 2) whether an immediate response is needed; or 3) whether the MRS qualifies for no further action (NFA). The CS Report at FTSW will investigate the explosive safety threat posed by MEC at the MMRP eligible sites (MRS). The secondary goal of the CS is to collect information to complete the Cost to Complete (CTC) estimates and data to apply the MRS Prioritization Protocol for the MRSs. The data collected for this CS Report will be used to meet the secondary goal of the CS.
The environmental questions being asked: Are MEC and/or MC present at the site? A RCRA Facilities Investigation (RFI)/Corrective Measures Study (CMS) will be required at these MRSs based on historic EOD responses.
A synopsis of secondary data or information from site reports: The Final *Phase 2 Historical Records Review*, scheduled to be completed by Malcolm Pirnie in May 2010, details historical site information and range activities. Field work results will be documented in the CS Report.
The possible classes of contaminants and the affected matrices: MC related to the suspected use potentially exist in the soil at the sites. Expected MC includes metals (aluminum, antimony, copper, lead, and zinc) and explosives.
The rationale for inclusion of chemical and nonchemical analyses: Chemical analyses will be conducted to determine the presence and concentrations of selected metals (aluminum, antimony, copper, lead, and zinc) and explosives at the sites.
Information concerning various environmental indicators: A magnetometer will be used to determine if munitions are present during the site walk. MEC activities are described in Section 3.1 of the CS Work Plan.
Project decision conditions ("If..., then..." statements): If concentrations of MC exceed applicable screening values, further investigation will be recommended. If MC are detected at concentrations less than the screening values, then it will be documented to support the RFI/CMS.

QAPP Worksheet # 11 Project Quality Objectives /Systematic Planning Process Statements (UFP-QAPP Manual Section 2.6.1)

Who will use the data? USACE, USAEC, FTSW, GAEPD, and Malcolm Pirnie
What will the data be used for? Data needs include confirmation of the extent of chemical contaminants in soils on the site. Analytical results will be used to determine if MC exists at the site. If MC are present, the analytical data will also be used to determine the concentrations of existing MC, one of the factors to decide whether the site will go toward a RFI/CMS.
What type of data are needed? (target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques) Surface soil samples will be a discrete grab sample. During MC sampling, thirty-nine soil samples, including QC samples, will be collected at the site. To determine if MC exist at the site, these surface soil samples will be analyzed for selected metals (aluminum, antimony, copper, lead, and zinc) using Method 6010B and explosives using Method 8330B mod.
How "good" do the data need to be in order to support the environmental decision? If concentrations of MC exceed applicable screening values, further investigation will be recommended. If MC are detected at concentrations less than the screening values, then it will be documented to support the RFI/CMS. An internal data verification will be performed, by Malcolm Pirnie staff independent of the project, in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (USEPA, 2004), USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA, 1999), and QC parameters set forth by the project laboratory, Katahdin Analytical Services. The results will be documented in a Chemical Data Quality Assessment report.
How much data are needed? (number of samples for each analytical group, matrix, and concentration) Thirty-nine soil samples, including QC samples, will be collected for selected metals (aluminum, antimony, copper, lead, and zinc) using Method 6010B and explosives using Method 8330B mod. The expected concentrations of selected metals and explosives are low.
Where, when, and how should the data be collected/generated? Thirty-nine soil samples, including QC samples, will be collected for selected metals (aluminum, antimony, copper, lead, and zinc) and explosives at FTSW. Sampling will be performed using disposable plastic scoops. A detailed description of the sampling scheme can be found in Table 2-2 of the CS Work Plan. Surface soil samples will be a discrete grab sample. Containers will be labeled with the appropriate information (sample identification, date and time collected, requested parameters) and placed in ice-filled cooler for transport to the laboratory. Soil sampling is scheduled to take place in July 2010.

Who will collect and generate the data? Samples will be collected by Malcolm Pirnie personnel and submitted to an off-site laboratory, Katahdin Analytical Services, for metals and explosives analysis. An internal/independent data verification will be performed and the results will be documented in a Chemical Data Quality Assessment report.
How will the data be reported? The laboratory data will be provided in a full analytical data package meeting the requirements of the USEPA National Functional Guidelines including all the documentation associated with the analyses of the samples. These include copies of the Chain of Custody Forms, sample receipt records, lab notes and narrative logs, QC data, the raw data, and the analytical results on tabulated forms (the date sheets must include the dates the samples were collected, received and analyzed). Laboratory electronic data deliverables will be prepared using the Level 3 data review evaluation software. All the analytical data generated during this field effort will be uploaded into the Army's Environmental Restoration Information Systems (ERIS) Web-based database. Data from the sample analyses will be included in the CS Report. General observations, findings, and conditions from field activities will be recorded in the field notebook and included as an appendix to the CS Report.
How will the data be archived? The CS Report, including all analytical data, will be archived in Malcolm Pirnie's data and file systems.

QAPP Worksheet # 12 Measurement Performance Criteria Table
(UFP-QAPP Manual Section 2.6.2)

Matrix	Surface Soil
Analytical Group	Metals (Aluminum, Antimony, Copper, Lead, Zinc)
Concentration Level	Low

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Discrete Soil Samples	SW-846 Method 6010B/SOP CA-608-06	Accuracy / Bias	No analyte > 2 x LOD	Calibration blanks	A
		Accuracy / Bias	No analyte > ½ LOQ	Method blanks	S
		Accuracy / Bias	90-110%	High Calibration Standard	A
		Accuracy / Bias	80-120%	Laboratory Fortified Sample	A
		Accuracy / Bias	90-110%	Quality Control Sample	A
		Accuracy / Bias	90-110%	Instrument Performance Check Solution Same Source	A
		Accuracy / Bias	80-120%	Reporting Limit Standard	A
		Accuracy / Bias	80-120%	Matrix Spike (MS) / Matrix Spike Duplicate (MSD)	A

LOD=Limit of Detection
LOQ=Limit of Quantitation

Measurement Performance Criteria Table—Target Compound List (TCL) Explosives

Matrix	Surface Soil
Analytical Group	TCL Explosives
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP	Data Quality Indicators	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Discrete Soil Samples	SW-846 Method 8330/ SOP CA-402-03	Sensitivity	No analyte detected above LOQ	Method Blanks	A
		Accuracy / Bias	30-150% recovery	Laboratory Control Sample	A
		Accuracy / Bias	20% detection	Calibration verification	A
		Accuracy / Bias	30-150% recovery; 30% RPD	MS/MSD	A

Notes:
Katahdin Analytical Services is Department of Defense Quality Systems Manual compliant for this method.

RPD = Relative Percent of Difference

QAPP Worksheet # 13 Secondary Data Criteria and Limitations Table
(UFP-QAPP Manual Section 2.7)

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
CS Report	USACE *Final Confirmatory Sampling Report, Fort Stewart, Georgia* November 2007	Malcolm Pirnie CS of FTSW MMRP sites 2007	Background information on Army activities; environmental setting; biota; pathway analysis; and soil sampling data	The sites addressed under the Malcolm Pirnie Phase 2 CS were not included in the 2007 document, due to the change in the cantonment area footprint.

QAPP Worksheet # 14 Summary of Project Tasks
(UFP-QAPP Manual Section 2.8.1)

Project Tasks are described in Section 3.4 of the CS Work Plan.

Sampling Tasks: Thirty-nine soil samples, including QC samples, will be collected for selected metals (aluminum, antimony, copper, lead, and zinc) and explosives at FTSW. A detailed description of the sampling scheme can be found in Table 2-2 of the CS Work Plan.
Analysis Tasks: Soil will be analyzed for lead using USEPA Method 6010B for selected metals and 8330B modified for explosives.
Quality Control Tasks: Analytical methods will include initial calibrations, continuing calibrations, method blanks, surrogates (for explosives analyses), laboratory control samples, and MS/MSDs.
Secondary Data: Previous reports regarding this site were reviewed during the development of the CS Report.
Data Management Tasks: All field notes and documentation of findings will be stored in project files. Electronic data deliverables will be submitted for the analytical data, which will be stored in a database. All electronic data will be backed up. Hardcopies of the laboratory data will also be available in project files.
Documentation and Records: All hardcopy data (e.g., field notebooks, field forms, photographs) will be taken to the Malcolm Pirnie Baltimore office and kept in the project files and added to the reports.
Assessment/Audit Tasks: Assessment and audit tasks will occur as needed to fulfill project objectives and Data Quality Objectives (DQOs).
Data Review Tasks: An internal data verification will be performed, by Malcolm Pirnie staff independent of the project, in accordance with the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (USEPA, 2004), USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA, 1999), and QC parameters set forth by the project laboratory, Katahdin Analytical Services. The results will be documented in a Chemical Data Quality Assessment report.

QAPP Worksheet # 15 Reference Limits and Evaluation Table
(UFP-QAPP Manual Section 2.8.1)

Reference Limits Table – Soil

Analytical Group	Analyte	CAS[1] Number	FTSW Inorganic/Metal Background Concentration[2]		USEPA Region 4 Ecological Screening Values Surface Soil		USEPA Region 9 Regional Screening Levels Surface Soil[3]		Project LOQs[4]	Analytical Method		Achievable Laboratory Limits	
										LOD	Method LOQ	Lab LOD[5]	Lab LOQs[6]
			(ug/kg)	basis	(ug/kg)	basis	(ug/kg)	Basis	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
MEC Indicator Metals (SW-846 Method 6010B)	Aluminum	7429-90-5	--	n	--	n	77,000	N	25,667	NA	NA	2,900	30,000
	Antimony	7440-36-0	--	n	--	n	3,100	N	1,033	NA	NA	99	800
	Copper	7440-50-8	--	n	9,000	n	310,000	N	103,333	NA	NA	95	2,500
	Lead	7439-92-1	11,100	n	2,500	n	400,000	N	133,333	NA	NA	140	500
	Zinc	7440-66-6	15,500	n	120,000	n	2,300,000	N	766,667	NA	NA	170	2,500
Explosives (SW-846 Method 8330B modified, prep incorporated)[7]	1,3,5-Trinitrobenzene (1,3,5-TNB)	99-35-4	--	n	--	n	220,000	N	73,333	NA	NA	6.7	100
	1,3-Dinitrobenzene (1,3-DNB)	99-65-0	--	n	--	n	610	N	203	NA	NA	6.2	100
	2,4,6-Trinitrotoluene (2,4,6-TNT)	118-96-7	--	c	--	c	19,000	C	6,333	NA	NA	6.7	100
	2,4-Dinitrotoluene (2,4-DNT)	121-14-2	--	c	20,000	c	1,600	C	533	NA	NA	15	100
	2,6-Dinitrotoluene (2,6-DNT)	606-20-2	--	n	--	n	6,100	N	2,033	NA	NA	27	100
	2-Amino-4,6-dinitrotoluene (2-Am-DNT)	355-72-78-2	--	n	--	n	15,000	N	5,000	NA	NA	21	100
	2-Nitrotoluene (2-NT)	88-72-2	--	c	--	c	2,900	C	967	NA	NA	12	100
	3-Nitrotoluene (3-NT)	99-08-1	--	n	--	n	120,000	N	40,000	NA	NA	7.9	100
	4-Amino-2,6-dinitrotoluene (4-Am-DNT)	19406-51-0	--	n	--	n	15,000	N	5,000	NA	NA	17	100
	4-Nitrotoluene (4-NT)	99-99-0	--	c	--	c	30,000	C	10,000	NA	NA	27	100
	Octahydro-1,3,5,7-tetrnitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	--	n	--	n	380,000	N	126,667	NA	NA	8.6	100
	Nitrobenzene (NB)	98-95-3	--	c	40,000	c	4,400	C	1,467	NA	NA	22	100
	Hexahydro-1,3,5-trinitro-1,3,5-trizine (RDX)	121-82-4	--	c	--	c	5,500	C	1,833	NA	NA	6.8	100
	2,4,6-Trinitrophenyl-N-methylnitramine (Tetryl)	479-45-8	--	n	--	n	24,000	N	8,000	NA	NA	5.41	100
	Ethylene Glycol Dinitrate (EGDN)	628-96-6	--		--		--		--	NA	NA	42	800
	Nitroglycerin (NG)	55-63-0	--	n	--	n	610	N	203	NA	NA	124	800

Analytical Group	Analyte	CAS[1] Number	FTSW Inorganic/Metal Background Concentration[2]		USEPA Region 4 Ecological Screening Values Surface Soil		USEPA Region 9 Regional Screening Levels Surface Soil[3]		Project LOQs[4]	Analytical Method		Achievable Laboratory Limits	
			(ug/kg)	basis	(ug/kg)	basis	(ug/kg)	Basis	(ug/kg)	LOD (ug/kg)	Method LOQ (ug/kg)	Lab LOD[5] (ug/kg)	Lab LOQs[6] (ug/kg)
	3,5-Dinitroaniline (3,5-DNA)	618-87-1	--		--		--		--	NA	NA	4	100
	Pentaerythritol tetranitrate (PETN)	78-11-5	--		--		--		--	NA	NA	108	800

µg/kg = micrograms per kilogram
NA = Not available
[1] Chemical Abstract Service (CAS)
[2] Basis: c = based on a target cancer risk of 10^{-6}; n = based on target hazard quotient of 0.1
[3] Project Action Levels are the USEPA RSLs for residential soil since the potential for direct contact with soil is the primary focus of the CS. USEPA Regional Screening Levels for residential soil and protection of groundwater from the RSL Table Master APRIL 2009.
[4] Project LOQs represent the Project Action Levels divided by 3.
[5] LODs generated by the analytical laboratory per guidelines published in 40 CFR Part 136, Appendix B.
[6] Laboratory LOQs for SW-846 Methods 8330 and 6010.
[7] USEPA Method 8330B-modified includes the analytical portion of 8330B to include three additional compounds (18 compounds in all) to the explosive suite. Nitroglycerin will be determined by the laboratory using a multi-wavelength Ultra Violet detector at a separate more sensitive wavelength of 214 nanometers.

QAPP Worksheet # 16 Project Schedule Timeline Table
(UFP-QAPP Manual Section 2.8.2)

The project schedule is outlined in Appendix F of the CS Work Plan.

Activities	Organization	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Kickoff Meeting	Malcolm Pirnie, Inc.	8/12/09	8/12/09	Meeting Minutes	8/12/09
Draft HRR	Malcolm Pirnie, Inc.	8/17/09	1/25/10	Draft HRR	1/25/10
Stakeholder Draft HRR	Malcolm Pirnie, Inc.	2/16/10	3/1/10	Stakeholder Draft HRR	3/1/10
Technical Project Planning (TPP) #2 Meeting	Malcolm Pirnie, Inc.	4/29/10	4/29/10	Meeting Minutes	4/29/10
Final HRR	Malcolm Pirnie, Inc.	4/27/10	5/10/10[1]	Final HRR	5/10/10
Stakeholder Draft Work Plan	Malcolm Pirnie, Inc.	4/30/10	5/14/10	Stakeholder Draft Work Plan	5/14/10
Final Work Plan	Malcolm Pirnie, Inc.	7/9/10	7/16/10	Final Work Plan	7/16/10
Field Work	Malcolm Pirnie, Inc.	7/19/10	7/23/10	MC Sampling Logs, Data Analysis to be included in CS Report	7/23/10
Draft CS Report	Malcolm Pirnie, Inc.	7/26/10	9/17/10	Draft CS Report	9/17/10
Stakeholder Draft CS Report	Malcolm Pirnie, Inc.	10/11/10	12/3/10	Stakeholder Draft CS Report	12/3/10
TPP #3 Meeting	Malcolm Pirnie, Inc.	1/31/11	1/31/11	Meeting Minutes	1/31/11
Final CS Report	Malcolm Pirnie, Inc.	1/31/11	3/10/11	Final CS Report	3/10/11

[1]Pending receipt of regulatory comments.

QAPP Worksheet # 17 Sampling Design and Rationale
(UFP-QAPP Section 3.1.1)

Describe and provide a rationale for choosing the sampling approach (e.g., grid system, biased statistical approach):
The sampling approach is described in Section 4 of the Work Plan.
Describe the sampling design and rationale in terms of what matrices will be sampled, what analytical groups will be analyzed and at what concentration levels, the sampling locations (including QC, critical, and background samples), the number of samples to be taken, and the sampling frequency (including seasonal considerations):
Thirty-nine soil samples, including QC samples, will be collected at FTSW. Four samples will be collected at each the Anti-Aircraft Range - 4 and the Anti-Tank 90MM Range – 2, fourteen samples will be collected at the Grenade Launcher Range, and ten samples will be collected at the Small Arms Range – 2. Samples for the Anti-Aircraft Range - 4, Anti-Tank 90MM Range – 2, and Grenade Launcher Range will be analyzed for selected metals (aluminum, antimony, copper, lead, and zinc) and explosives. Samples from the Small Arms Range – 2 will be analyzed for lead only. Appropriate QC samples (duplicates and MS/MSD pairs) will also be collected. A detailed description of the sampling scheme can be found in Table 2-2 of the CS Work Plan and Section 4 of the CS Work Plan.

QAPP Worksheet # 18 Sampling Locations and Methods/SOP Requirements Table
(UFP-QAPP Manual Section 3.1.1)

Sampling Location/ID Number	Matrix	Depth (inches)	Analytical Group[1]	Concentration Level	Rationale for Sampling Location
FTSW-SS-01-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-02-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-03-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-04-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-05-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-06-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-07-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-08-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-09-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-10-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-11-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-12-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-13-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-14-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-15-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-16-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-17-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-18-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-19-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-20-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-21-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-22-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-23-MMDDYYY	Soil	0-6	Lead	Low	Bias
FTSW-SS-24-MMDDYYY	Soil	0-6	Lead	Low	Bias
FTSW-SS-25-MMDDYYY	Soil	0-6	Lead	Low	Bias
FTSW-SS-26-MMDDYYY	Soil	0-6	Lead	Low	Bias
FTSW-SS-27-MMDDYYY	Soil	0-6	Lead	Low	Bias
FTSW-SS-28-MMDDYYY	Soil	0-6	Lead	Low	Bias
FTSW-SS-29-MMDDYYY	Soil	0-6	Lead	Low	Bias
FTSW-SS-30-MMDDYYY	Soil	0-6	Lead	Low	Bias
FTSW-SS-31-MMDDYYY	Soil	0-6	Lead	Low	Bias
FTSW-SS-32-MMDDYYY	Soil	0-6	Lead	Low	Bias
FTSW-SS-XX-DUP-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias

Sampling Location/ID Number	Matrix	Depth (inches)	Analytical Group[1]	Concentration Level	Rationale for Sampling Location
FTSW-SS-XX-DUP-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-XX-DUP-MMDDYYY	Soil	0-6	Lead	Low	Bias
FTSW-SS-XX-MS-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-XX-MSD-MMDDYYY	Soil	0-6	Selected metals, Explosives	Low	Bias
FTSW-SS-XX-MS-MMDDYYY	Soil	0-6	Lead	Low	Bias
FTSW-SS-XX-MSD-MMDDYYY	Soil	0-6	Lead	Low	Bias

[1]Selected metals include aluminum, antimony, copper, lead, and zinc.

QAPP Worksheet # 19 Analytical SOP Requirements Table
(UFP-QAPP Manual Section 3.1.1)

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Soil	Selected metals[1]	Low	SW-846 Method 6010B	8 ounce	glass jar or stainless steel sleeve	4 °Celsius	Metals - 180 days
Soil	Explosives	Low	SW-846 Method 8330B mod	8 ounce	glass jar or stainless steel sleeve	4 °Celsius	14 days for extraction; 40 days for analysis

[1]Selected metals include aluminum, antimony, copper, lead, and zinc.

QAPP Worksheet # 20 Field Quality Control Sample Summary Table
(UFP-QAPP Manual Section 3.1.1)

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference	No. of Sampling Locations	No. of Field Duplicates	No. of MS /MSD	No. of Equip. Blanks	Total No. of Samples to Lab
Soil	Selected metals	Low[1]	Laboratory SOP CA-608-06	32	3	4	1 per day[2]	39 + equipment blanks
Soil	Explosives	Low	Laboratory SOP CA-402-03	22	2	2	1 per day	26 + equipment blanks

[1]Selected metals include aluminum, antimony, copper, lead, and zinc.
[2]Field sampling is expected to take 5 days.

QAPP Worksheet # 21 Project Sampling SOP References Table
(UFP-QAPP Manual Section 3.1.2)

Key information from the sampling SOPs are summarized in Worksheet #12. The laboratory SOPs include:

- Determination of Nitroaromatics and Nitroamines by High Performance Liquid Chromatography (HPLC): Method 8330. July 2008.
- Trace Metals Analysis by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) Using USEPA Method 6010. September 2007.

QAPP Worksheet # 22 Field Equipment Calibration, Maintenance, Testing, and Inspection Table

(UFP-QAPP Manual Section 3.1.2.4)

Field Equipment	Calibration Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person
Handheld magnetometer	Handheld detector will be swept across selected known items within an area outside of the site to demonstrate consistent effectiveness.	Sufficient frequency to ensure accuracy and reproducibility of detection	Repeatable and predictable response to known stimuli	In the event that the equipment is not functioning at the specified standard, it will be fixed or replaced.	UXO Technical Lead or Field Team Member
Trimble Global Positioning System (GPS) receiving unit	N/A, with respect to calibration Number of satellites acquired and quality of data will be checked periodically while collecting GPS data.	Sufficient frequency to ensure accuracy and reproducibility of results	Acceptable data generation to provide location information and mapping of GPS points	In the event that the equipment is not functioning at the specified standard, it will be fixed or replaced.	Field team member

QAPP Worksheet # 23 Analytical SOP References Table
(UFP-QAPP Manual Section 3.2.1)

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?
CA-608-06	Trace Metal s Analysis by ICP-AES, September 2007	Definitive	Metals	Thermo Jarrell Ash (TJA) Trace	Katahdin Analytical Services	No
CA-402-03	Determination of Nitroaromatics and Nitramines by HPLC, July 2008	Definitive	Explosives	HPLC Agilent 1100	Katahdin Analytical Services	No

QAPP Worksheet # 24 Analytical Instrument Calibration Table
(UFP-QAPP Manual Section 3.2.2)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
TJA Trace	1-point plus blank	Every 20 samples	$R \geq 0.99$	Perform maintenance and recalibrate	Katahdin Analytical Services	CA-608-06
HPLC Agilent 1100	5-point calibration	Daily	$R \geq 0.95$	Perform maintenance and recalibrate	Katahdin Analytical Services	CA-402-03

Note:
R = Correlation coefficient

The SOPs are located as Attachment 1 to this QAPP.

QAPP Worksheet # 25 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table (UFP-QAPP Manual Section 3.2.3)

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
TJA Trace	Torch, nebulizer spray chamber, autosampler, and pump tubing maintenance	SW-846 Method 6010B	Check connections, flush lines, clean nebulizer	Frequency determined by instrument remaining in calibration and free of interference	Passing calibration	Reconnect sample pathways, recalibrate, reanalyze affected samples	Laboratory Analyst	CA-608-06
HPLC Agilent 1100	Lamp and guard column inspection Pump maintenance	SW-846 Method 8330B-modified	Leak and pressure test, guard column and lamp performance	Frequency determined by instrument remaining in calibration and free of interference	Passing calibrations	Replace lamp, replace guard column, tighten fittings, recalibrate, reanalyze	Laboratory Analyst	CA-402-03

The SOPs are located as Attachment 1 to this QAPP.

QAPP Worksheet # 26 Sample Handling System
(UFP-QAPP Manual Appendix A)

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): Malcolm Pirnie Field Team supervised by the Field Team Leader
Sample Packaging (Personnel/Organization): Malcolm Pirnie Field Team
Coordination of Shipment (Personnel/Organization): Malcolm Pirnie Field Team
Type of Shipment/Carrier: Federal Express for overnight delivery to laboratory
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Katahdin Analytical Services
Sample Custody and Storage (Personnel/Organization): Katahdin Analytical Services
Sample Preparation (Personnel/Organization): Katahdin Analytical Services
Sample Determinative Analysis (Personnel/Organization): Katahdin Analytical Services
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection): Samples will not be stored in the field, but will be shipped within 24 hours of collection. If an emergency requires that they are stored in the field, they will be kept in a cooler or transferred to a refrigerator kept at 4 degrees Celsius.
Sample Extract/Digestate Storage (No. of days from extraction/digestion): Sample extraction and digestion must be conducted according to the requirements given in Worksheet 19.
Biological Sample Storage (No. of days from sample collection): N/A
SAMPLE DISPOSAL
Personnel/Organization: Katahdin Analytical Services
Number of Days from Analysis: 60 days

QAPP Worksheet # 27 Sample Custody Requirements
(UFP-QAPP Manual Section 3.3.3)

Samples are delivered to the laboratory using commercial shippers or couriers. Documented procedures are followed for arriving samples to assure that custody and integrity are maintained and that handling and preservation requirements are documented and continued. Custody documentation includes all information necessary to provide an unambiguous record of sample collection, sample identification, and sample collection chronology. Initial custody documentation employs either Katahdin Analytical Services or client generated custody forms.

Upon arrival at the laboratory, the sample custodian reviews the chain of custody or Sample Receipt Confirmation form for the samples received to verify that the information on the form corresponds with the samples delivered. This includes verification that all listed samples are present and properly labeled, checks to verify that samples were transported and received at the required temperature, verification that the samples were received in proper containers, verification that sufficient volume is available to conduct the requested analyses, and a check of individual sample containers to verify test specific preservation requirements including the absence of headspace for volatile compound analysis.

Sample conditions and other observations are documented on the chain of custody by the sample custodian prior to completing acceptance of custody. The sample custodian accepts sample custody upon verification that the custody document is correct. Discrepancies or non-compliant situations are documented, flagged and communicated to the Katahdin Analytical Services project manager, who contacts the client for resolution. The resolution is documented and communicated to sample management for execution.

QAPP Worksheet # 28 QC Samples Table
(UFP-QAPP Manual Section 3.4)

Matrix	Soil
Analytical Group	Metals
Concentration Level	Low
Sampling SOP	CA-608-06
Analytical Method/ SOP Reference	SW-846 Method 6010B
Sampler's Name	Malcolm Pirnie Field Team
Field Sampling Organization	Malcolm Pirnie, Inc.
Analytical Organization	Katahdin Analytical Services
No. of Sample Locations	32

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality	Measurement Performance Criteria
Method Blank	1 per batch	No analyte > LOQ	Investigation source of contamination. Redigest and reanalyze all associated samples if sample concentration is >LOQ and < 10x the blank concentration.	Katahdin Analytical Services / Analyst	Accuracy / Bias	See Worksheet #12
Laboratory Control Sample	1 per 20 field samples	Metals Recovery: 80-120%	1) Investigate source of problem; 2) Redigest and reanalyze all associated samples.	Katahdin Analytical Services / Analyst	Accuracy	See Worksheet #12
MS/MSD / Laboratory Duplicate (metals only)	1 per 20 field samples / up to 4 MS/MSD total (one MS/MSD sample is counted as two samples)	Metals Recovery: 80-120%; RPD ≤20%	Flag results. Data will be reported with appropriate qualifying codes.	Katahdin Analytical Services / Analyst	Accuracy / Bias and Precision in Field Samples	See Worksheet #12
Serial dilution	1 per batch	5-fold dilution must agree within 10% of the original result	Flag result or dilute and reanalyze sample to eliminate interference.	Katahdin Analytical Services / Analyst	Accuracy	See Worksheet #12

Matrix	Soil
Analytical Group	Explosives
Concentration Level	Low
Sampling SOP	CA-402-03
Analytical Method/ SOP Reference	SW-846 Method 8330B-modified
Sampler's Name	Malcolm Pirnie Field Sampling Crew
Field Sampling Organization	Malcolm Pirnie, Inc.
Analytical Organization	Katahdin Analytical Services
No. of Sample Locations	32

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality	Measurement Performance Criteria
Method Blank	1 per batch	No analyte >LOQ	Investigate the source of contamination. Correct problem. Reprep and reanalyze all associated samples.	Katahdin Analytical Services. / Analyst	Accuracy / Bias	See Worksheet #12
Laboratory Control Sample	1 per batch	30-150% recovery	Correct problem, then reprepare and reanalyze the laboratory control sample and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Katahdin Analytical Services. / Analyst	Accuracy	See Worksheet #12
Calibration verification	1 per 10 samples, midpoint of initial calibration	20% detection	Evaluate the samples: If the % detection >+20% and sample results <LOQ, narrate. : If the % detection >±20% and is likely a result of matrix interference, narrate. Otherwise reanalyze back to the last acceptable calibration verification.	Katahdin Analytical Services. / Analyst	Accuracy	See Worksheet #12
MS/MSD	1 per 20 field samples / up to 4 MS/MSD total (one MS/MSD sample is counted as two samples)	30-150% recovery; 30% RPD	Flag results. Data will be reported with appropriate qualifying codes.	Katahdin Analytical Services. / Analyst	Accuracy / Bias and Precision in Field Samples	See Worksheet #12

QAPP Worksheet # 29 Projects Documents and Records Table
(UFP-QAPP Manual Section 3.5.1)

Documents and Records	Where Maintained
Project Schedule	Project files in Malcolm Pirnie's Baltimore office
Meeting Agendas and Minutes	Project files in Malcolm Pirnie's Baltimore office
Site Visit / Data Collection Summary	Project files in Malcolm Pirnie's Baltimore office
Draft, Draft Final, and Final CS Report with Appendices	Project files in Malcolm Pirnie's Baltimore office
Draft, Draft Final, and Final CS Report with Appendices	Project files in Malcolm Pirnie's Baltimore office
Written Review Comments	Project files in Malcolm Pirnie's Baltimore office
Tabulated Responses to Comments	Project files in Malcolm Pirnie's Baltimore office
Safety Log and Forms	Project files in Malcolm Pirnie's Baltimore office
Field Log and Forms	Project files in Malcolm Pirnie's Baltimore office
Photograph Log	Project files in Malcolm Pirnie's Baltimore office
Data Quality Control Report (DQCR)s	Project files in Malcolm Pirnie's Baltimore office
GPS Data Table	Project files in Malcolm Pirnie's Baltimore office
GIS Files	Project files in Malcolm Pirnie's Baltimore office
Electronic Data Deliverables	Uploaded into the Army's ERIS Web-based database

Project Documents and Records Table (continued)

Sample Collection Documents and Records	On-site Analysis Documents and Records	Off-site Analysis Documents and Records	Data Assessment Documents and Records	Other
GPS data table GIS files	Safety Log and Forms Field Log and Forms Photographic Log DQCRs Site Visit / Data Collection Summary	Laboratory Data	Draft, Draft Final, and Final CS Report with Appendices	Project Schedule Meeting Minutes and Agenda Written Review Comments Tabulated Response to Comments Draft, Draft Final, and Final CS Work Plan

QAPP Worksheet # 30 Analytical Services Table
(UFP-QAPP Manual Section 3.5.2.3)

Matrix	Analytical Group	Concentration Level	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number
Soil	Selected metals	Low	CA-608-06	30 days maximum	Katahdin Analytical Services 600 Technology Way Scarborough, ME 04074 Contact: Greg Lull Phone: (207) 874-2400 x16	Analytical Laboratory Services 34 Dogwood Lane Middletown, PA 17057 Contact: Tonya Hironimus Phone: (717) 944-5541 x3108
Soil	Explosives	Low	CA-402-03	30 days maximum	Katahdin Analytical Services 600 Technology Way Scarborough, ME 04074 Contact: Greg Lull Phone: (207) 874-2400 x16	Analytical Laboratory Services 34 Dogwood Lane Middletown, PA 17057 Contact: Tonya Hironimus Phone: (717) 944-5541 x3108

QAPP Worksheet # 31 Planned Project Assessments Table
(UFP-QAPP Manual Section 4.1.1)

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA) (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of CA (Title and Organizational Affiliation)
Equipment Function Checks	Daily, during field activities	Internal	Malcolm Pirnie	Assigned Field Team Member(s) Malcolm Pirnie	Shelly Kolb, PM Malcolm Pirnie	Rosemarie Fehrman, Field Team Leader Malcolm Pirnie	Shelly Kolb, PM Malcolm Pirnie
Tailgate Safety Meetings	Daily, during field activities	Internal	Malcolm Pirnie	UXO Technical Lead Malcolm Pirnie	Shelly Kolb, PM Malcolm Pirnie	George Overby, UXO Technical Lead Malcolm Pirnie	Shelly Kolb, PM Malcolm Pirnie
In-process data checks	Daily, during field activities	Internal	Malcolm Pirnie	Assigned Field Team Member(s) Malcolm Pirnie	Shelly Kolb, PM Malcolm Pirnie	Rosemarie Fehrman, Field Team Leader Malcolm Pirnie	Shelly Kolb, PM Malcolm Pirnie
Verification of identified MEC and munitions debris items	Daily, during field activities	Internal	Malcolm Pirnie	UXO Technical Lead Malcolm Pirnie	Shelly Kolb, PM Malcolm Pirnie	George Overby, UXO Technical Lead Malcolm Pirnie	Shelly Kolb, PM Malcolm Pirnie
Review field forms and field log	Daily, following field activities	Internal	Malcolm Pirnie	Field Team Leader Malcolm Pirnie	Shelly Kolb, PM Malcolm Pirnie	Shelly Kolb, PM Malcolm Pirnie	Shelly Kolb, PM Malcolm Pirnie
DQCRs	Daily, following field activities	Internal	Malcolm Pirnie	Field Team Leader Malcolm Pirnie	Shelly Kolb, PM Malcolm Pirnie	Shelly Kolb, PM Malcolm Pirnie	Shelly Kolb, PM Malcolm Pirnie
GPS data post-processing and review	Immediately following completion of field activities	Internal	Malcolm Pirnie	Assigned Field Team Member(s) / Amy Atamian Malcolm Pirnie	Shelly Kolb, PM Malcolm Pirnie	Amy Atamian Malcolm Pirnie	Shelly Kolb, PM Malcolm Pirnie

QAPP Worksheet # 32 Assessment Findings and Corrective Action Responses (UFP-QAPP Manual Section 4.1.2)

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Org.)	Timeframe for Response
Equipment Function Checks	Field forms, Field Log, DQCR	Shelly Kolb, PM Malcolm Pirnie	Daily	Field forms, Field Log, DQCR	Shelly Kolb, PM Malcolm Pirnie	Daily
Tailgate Safety Meeting	Field forms, Field Log, DQCR	Shelly Kolb, PM Malcolm Pirnie	Daily	Field forms, Field Log, DQCR	Shelly Kolb, PM Malcolm Pirnie	Daily
In-process data checks	Field forms, Field Log, DQCR	Shelly Kolb, PM Malcolm Pirnie	Daily	Field forms, Field Log, DQCR	Shelly Kolb, PM Malcolm Pirnie	Daily
Verification of identified MEC and munitions debris items	Field forms, Field Log, DQCR	UXO Technical Lead Malcolm Pirnie	Daily	Field forms, Field Log, DQCR	Shelly Kolb, PM Malcolm Pirnie	Daily
Review of field forms and field log	Field forms, Field Log, DQCR	Shelly Kolb, PM Malcolm Pirnie	Daily	Field forms, Field Log, DQCR	Shelly Kolb, PM Malcolm Pirnie	Daily
DQCRs	DQCR	Shelly Kolb, PM Malcolm Pirnie	Daily	DQCR	Shelly Kolb, PM Malcolm Pirnie	Daily

QAPP Worksheet # 33 QA Management Reports Table
(UFP-QAPP Manual Section 4.2)

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
DQCR	Daily report; weekly distribution	Weekly during field activities	Rosemarie Fehrman, Field Team Leader Malcolm Pirnie	See Worksheet #3
Chemical Data Quality Assessment	During CS Report preparation; once	Appendix to the CS Report	Marla Miller, Chemist Malcolm Pirnie	See Worksheet #3
CS Report	Draft, Draft Final, Final; once each	Following completion of fieldwork	Shelly Kolb, PM Malcolm Pirnie	See Worksheet #3

QAPP Worksheet # 34 Verification (Step I) Process Table
(UFP-QAPP Manual Section 5.2.1)

Verification Input	Description	Internal/ External	Responsible for Verification (Name, Organization)
Required approval of QAPP	Receipt of the required signatures needed for QAPP approval will be verified.	Internal	Shelly Kolb, PM Malcolm Pirnie
QC Comparison Criteria, LODs, Project Quality Objectives (PQOs)	Performance requirements, QC criteria, and LODs for all inputs will be verified against PQOs.	Internal/ External	Shelly Kolb, PM Malcolm Pirnie Internal Data Validation
Chain of Custody	Chain-of-custody forms will be reviewed and verified against the packed sample coolers they represent prior to shipping samples to the laboratory.	Internal	Rosemarie Fehrman, Field Team Leader Malcolm Pirnie
Sample Conditions and Chronology	Sample condition upon receipt, storage records, and the chronology of sample receipt, extraction, and analyses times will be verified. Signatures required for laboratory sign-off will also be verified.	External	Internal Data Validation
QC Results Documentation	Documentation of QC results for sample duplicates and spikes will be verified.	External	Internal Data Validation
Analytical Data Package	All analytical data packages will be verified by the laboratory performing the work for completeness prior to submittal and by the data validator to decide if the data meet the screening criteria.	External	Katahdin Analytical Services Internal Data Validation
Analytical Data	Analytical data will be reviewed to verify that they meet screening criteria and DQOs.	External	Internal Data Validation
Laboratory Assessments and Corrective Action Reports (CARs)	Laboratory assessments and any CARs that may have been generated during sample analyses will be reviewed and verified against PQOs.	External	Internal Data Validation

QAPP Worksheet # 35 Validation (Steps IIa and IIb) Process Table
(UFP-QAPP Manual Section 5.2.2)

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Name, Organization)
IIa	Maps, sample identifications, sample locations	A map of sample identifications and locations will be created from GPS data to verify that the locations and quantities of samples were collected as dictated by the FSP. The map(s) will be produced after all GPS data is collected.	Shelly Kolb, PM Malcolm Pirnie
IIa	Internal laboratory chain of custody	An electronic chain of custody will be created and sent to the laboratory to verify information from chains of custody sent during sample shipments. Validation of the chains of custody will ensure that the proper number of samples and QC samples were collected as dictated in the FSP. This will occur immediately after all samples are shipped to the lab and after fieldwork has been completed.	Rosemarie Fehrman, Field Team Leader Malcolm Pirnie
IIa	Documentation of deviation from sampling methods	Any documentation of deviations from methods made during fieldwork will be compared to the CS Work Plan, FSP, and sampling SOPs to determine if the deviations affect DQOs and/or PQOs. This will occur upon the receipt of any documentation of sampling deviations.	Shelly Kolb, PM Malcolm Pirnie
IIa	Documentation of deviation from sampling methods	Any documentation of deviations from methods made during sample analyses will be compared to the applicable analytical method SOPs to determine if the deviations affect DQOs and/or PQOs. This will occur upon the receipt of any documentation of analyses deviations.	Internal Data Validation
IIb	Chemical Data Quality Assessment Report	An internal data verification will be performed, by Malcolm Pirnie staff independent of the project, in accordance with the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (USEPA, 2004), USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA, 1999), and QC parameters set forth by the project laboratory, Katahdin Analytical Services. The results will be documented in a Chemical Data Quality Assessment report.	Marla Miller, Chemist Malcolm Pirnie

QAPP Worksheet # 36 Validation (Steps IIa and IIb) Summary Table
(UFP-QAPP Manual Section 5.2.2)

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)
IIa	Soil	Metals	Low	SW-846 Method 6010 SOPs	Internal Data Validation, Inc.
IIa	Soil	Explosives	Low	SW-846 Method 8330 SOPs	Internal Data Validation, Inc.
IIb	Soil	Metals	Low	SW-846 Method 6010 SOPs	Internal Data Validation, Inc.
IIb	Soil	Explosives	Low	SW-846 Method 8330 SOPs	Internal Data Validation, Inc.

QAPP Worksheet # 37 Usability Assessment
(UFP-QAPP Manual Section 5.2.3)

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used: GPS data will be post-processed; analytical data will be validated; analytical data will be compared with regulatory criteria.
Describe the evaluative procedures used to assess overall measurement error associated with the project: Measurement error related to GPS position data will be determined based on the post-processed data. Measurement error will be included with the tabulated data.
Identify the personnel responsible for performing the usability assessment: A Malcolm Pirnie team member will perform the GPS field data post-processing, post-processed data analysis, and usability assessment. Analytical data validation will be performed by Internal Data Validation, an independent third party.
Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies: • GPS data – Tabulated in CS Report; • Chemical Data Quality Assessment Report – provided as an appendix to the CS Report; a summary provided in the CS Report

QAPP Worksheet # 38 References

Katahdin Analytical Services. Determination of Nitroaromatics and Nitroamines by HPLC: Method 8330. July 2008.

Katahdin Analytical Services. Trace Metals Analysis by ICP-AES Using USEPA Method 6010. September 2007.

Malcolm Pirnie. 2010. Work Plan. Phase 2 Confirmatory Sampling Report, Fort Stewart, Georgia.

United States Environmental Protection Agency. 2001. Requirements for Quality Assurance Project Plans. USEPA QA/R-5.

United States Environmental Protection Agency. 2005. *Uniform Federal Policy for Quality Assurance Plans: Part 1: UFP-QAPP Manual.*

United States Environmental Protection Agency. 2004. *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.*

United States Environmental Protection Agency. 1999. *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review.*

Appendix B: Health and Safety Plan

B-1: Phase 2 SSHP Addendum
B-2: Phase 1 Confirmatory Sampling Health and Safety Plan (Provided on enclosed CD)

Fort Stewart Health and Safety Addendum

Introduction

Malcolm Pirnie will adhere to the safety guidelines applicable to those activities covered by the attached Site Safety and Health Plan, which includes field work to be conducted at Fort Stewart, Georgia in July 2010. This field work will include soil sampling and an instrument assisted visual survey.

By their signature, the undersigned certify this Site Safety and Health Plan will be used for the protection of the health and safety of Malcolm Pirnie personnel, subcontractors, and visitors during the site investigations. The effective dates of this Plan are May 2010 through December 2010.

Heather Polinsky, Vice President
Project Officer
Malcolm Pirnie, Inc.

Shelly Kolb
Project Manager
Malcolm Pirnie, Inc.

Chuck Myers, CIH
Project Health and Safety Manager
Malcolm Pirnie, Inc.

Al Larkins
UXO Safety Officer
Malcolm Pirnie, Inc.

Site Description:
FTSW consists of 279,081 acres and is located north of Hinesville, GA, approximately 40 miles southwest of Savannah, GA. FTSW is the largest Army installation east of the Mississippi River, spanning portions of Bryan, Evans, Liberty, Long, and Tattnall counties. FTSW is bisected by Georgia Highway 119, which runs north to south from Pembroke to Hinesville and Georgia Highway 144, which runs east to west from Richmond Hill to Glennville. Situated south of Interstate 16 and west of Interstate 95, the installation boundaries are roughly defined by the intersection of Interstate 16 and Interstate 95 and the cities of Richmond Hill, Hinesville, Glennville, Claxton, and Pembroke.

Four MMRP sites will be investigated during the CS at FTSW. These are:

- Anti-Aircraft Range - 4 (661 acres)
- Anti-Tank Range 90mm - 2 (546 acres)
- Grenade Launcher Range (132 acres)
- Small Arms Range - 2 (287 acres)

Site-specific health and safety concerns (e.g., poisonous snakes, vegetations):

- Slip/Trip/Fall potential due to uneven ground while walking sites
- Heat Stress
- Ticks (e.g., tick borne diseases); mosquitoes (West Nile virus); black flies, horse flies, deer flies, bees, wasps
- Imported fire ants (these ants live in an earthen nest or mound of excavated soil with a hard, rain-resistant crust. They respond rapidly to any disturbance of colony or food source and can sting repeatedly; sting causes a localized intense burning sensation).
- Poisonous Snakes (e.g., Copperhead)
- Poison Ivy/Oak/Sumac
- Spiders (e.g., black widow and brown recluse; bite requires immediate medical treatment; attempt to capture spider to take to medical center for proper identification)
- Mechanical Hazards (e.g., pinch points in vehicles)
- Chemical Hazards (e.g., metals and explosives in soil)
- Potential to Encounter MEC (e.g., Live Large Caliber, Medium Caliber, Small Arms, Hand Grenades, Mortars, and Live Pyrotechnics.)

Refer to the Activity Hazard Analysis (provided as Attachment 1 to the March 2007 MMRP HASP) for additional information regarding site-specific hazards and procedures to control or mitigate the hazard.

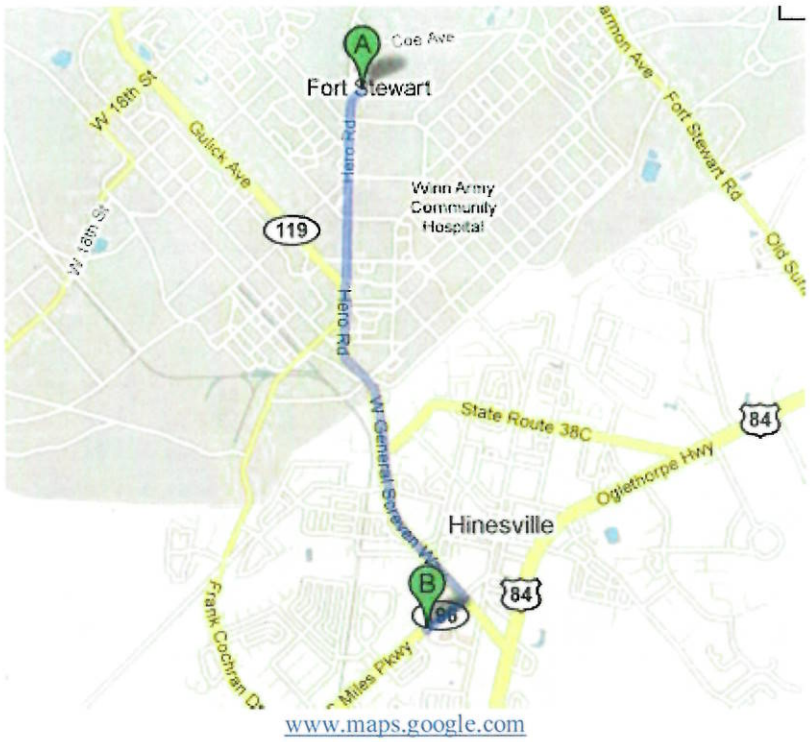
TABLE 1 EMERGENCY TELEPHONE NUMBERS	
Fort Stewart Department of Training Range Control:	(912) 767-8100 or (912) 767-8777;
Fort Stewart EOD:	(912) 767-8717 or (912) 767-8718
Fort Stewart Military Police Desk Operations:	(912) 767-2822 or (912) 767-2823 or (912) 767-2824
Fort Stewart Range Control-Range Officer:	Jim Pearson (912) 767-8679
Fort Stewart Directorate of Emergency Services:	(912) 767-8427
Hinesville County Fire/Police/Ambulance:	911
Hospital near Fort Stewart: Liberty Regional Medical Center 426 Elma G Miles Pkwy Hinesville, GA 31313	Main number: (912) 369-9400
THE FOLLOWING PEOPLE WILL BE NOTIFIED IF AN INCIDENT HAS OCCURRED:	
Malcolm Pirnie Director, Environmental Health & Safety: Chuck Myers, CIH	Mobile Phone: 914-484-7151
Project Manager: Shelly Kolb	Mobile Phone: (410) 258-4200
Deputy Project Manager: Rosemarie Fehrman	Mobile Phone: (862) 432-7728
UXO Site Safety Officer: Al Larkins, UXO Technician	Mobile Phone: (443) 801-7819
Project Manager Baltimore Corps of Engineers: Marc Randrianarivelo	Work Phone: (410) 320-9522
Installation POC: Algeana Stevenson	Work Phone: (912) 315-5144

Directions to:

Liberty Regional Medical Center
426 Elma G Miles Pkwy
Hinesville, GA 31313

Directions to Hospital from Fort Stewart:

1. Start out going south on HERO RD. (.3 miles)
2. Turn slight left onto GA-119 S. (1.8 miles)
3. Turn right onto GA119 / GA-196/ EG Miles PKWY. (.3 miles)
4. End at 426 Elma G Miles Pkwy. Hinesville, GA 31313-4000



www.maps.google.com

Figure 1: Route to Liberty Regional Medical Center from Fort Stewart Cantonment Area

Appendix C: Technical Project Planning Session Meeting Minutes

(Provided on enclosed CD)

Appendix D: Field Forms

(Provided on enclosed CD)

Appendix E: HRR Conceptual Site Models

(Provided on enclosed CD)

Appendix F: Project Schedule

(Provided on enclosed CD)

Appendix G: Ordnance Technical Data Sheets

(Provided on enclosed CD)

Appendix H: Standard Operating Procedures

(Provided on enclosed CD)

Appendix I: Laboratory DoD Qualifications

(Provided on enclosed CD)